# SAFE ROUTES TO SCHOOL

## Volume 2: Detailed Results

**Report to the Legislature**

**by**

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## EXECUTIVE SUMMARY

### *Background*

The SR2S program was authorized by AB 1475 in 1999 and reauthorized by SB 10 in 2001. The program provides funding for construction projects near schools, with the intent of increasing pedestrian and bicyclist safety and improving the environment for non-motorized transportation to and from school.

This report evaluates the success of the SR2S program, as required by the authorizing legislation. While the legislative intent requires that this study have an emphasis on accident reduction, we note that a study of changes in accident rates resulting from SR2S construction is not yet possible, since research would have to track accident rates for several years after SR2S construction to infer an impact. For that reason, this study focuses on characteristics of vehicle traffic and pedestrian and bicycle traffic that are associated with pedestrian accidents. The data here include information on the yielding of vehicles to non-motorized traffic, vehicle counts, and vehicle speeds, all of which can be examined for changes that would correlate with improvements in pedestrian or bicyclist safety. The research team also observed the numbers of child pedestrians and bicyclists, and whether those pedestrians/bicyclists used a sidewalk, path, street, or shoulder. In addition to that, the research team distributed a survey to parents of schoolchildren at selected SR2S schools before and after SR2S project construction.

### *Study Design and Methods*

The research team collected baseline (pre- SR2S project construction) and post- SR2S project construction data for each of sixteen elementary school sites. Of the sixteen schools studied, full before and after data are only available for nine schools. At the other seven schools, SR2S project construction was not completed in time to be included in this report.

## SR2S Study Sites

| | City/County | Caltrans District | County | School Name | Improvement |
|---|---|---|---|---|---|
| **1** | City of Bell Gardens | 7 | Los Angeles | Cesar Chavez Elementary | Install traffic signal |
| **2** | City of Chino | 8 | San Bernardino | Newman Elementary | Install traffic signal |
| **3** | City of El Sobrante | 4 | Contra Costa | Sheldon Elementary | Construct sidewalk gap closures |
| **4** | City of Encinitas | 11 | San Diego | Ocean Knoll Elementary | Construct sidewalks |
| **5** | City of Glendale | 7 | Los Angeles | Glenoaks Elementary | Install in-pavement crosswalk signal system to alert approaching vehicles of children in the crosswalks |
| **6** | City of Gonzales | 5 | Monterey | La Gloria Elementary | Install sidewalks and bikeways, traffic signal, signs and pavement markings, traffic calming and traffic diversion |
| **7** | City of Malibu | 7 | Los Angeles | Juan Cabrillo Elementary | Construct pathway of decomposed granite, bordered by wood curb, with appropriate signage |
| **8** | City of Murrieta | 8 | Riverside | Murrieta Elementary | Install bike lanes, sidewalk, curb, gutter |
| **9** | City of Oakland | 4 | Alameda | Hawthorne Elementary | Construct sidewalk bulbout, pedestrian head |
| **10** | City of Rancho Cucamonga | 8 | San Bernardino | Jasper Elementary | Install pedestrian-activated flashing warning signal system |
| **11** | City of San Bernardino | 8 | San Bernardino | Mt. Vernon Elementary | Install traffic signal system |
| **12** | City of Santa Clarita | 7 | Los Angeles | Sulphur Springs Elementary | Construct pedestrian bridge over creek, construct sidewalk |
| **13** | City of South Gate | 7 | Los Angeles | Montara Elementary | Install flashing safety signal for pedestrian crossings, replace deteriorated sidewalk, install new street safety signal at crosswalks, install speed humps |
| **14** | City of Whittier | 7 | Los Angeles | Evergreen Elementary | Construct sidewalk and disabled access ramps around Evergreen Elementary School |
| **15** | City of Yucaipa | 8 | San Bernardino | Valley Elementary | Install sidewalk gap closures |
| **16** | San Bernardino County | 8 | San Bernardino | West Randall Elementary | Install sidewalk gap closures |

The SR2S projects at these sites are representative of six different project work types, as shown below.

| **Work Type** | **Schools** |
|---|---|
| Sidewalk improvements | Sheldon Elementary, West Randall Elementary (primarily sidewalks)<br>Murrieta Elementary, Valley Elementary, La G (includes other work types)<br>Juan Cabrillo Elementary, Ocean Knoll Elementary |
| Traffic calming & speed reduction | La Gloria Elementary, Hawthorne Elementary |
| Pedestrian/bicycle crossing | Mt. Vernon Elementary, Jasper Elementary, Valley Elementary, Glenoaks Elementary |
| Bicycle facilities (on-street or off-street) | La Gloria Elementary, Murrieta Elementary |
| Traffic control devices | Cesar Chavez Elementary, Newman Elementary |
| Traffic diversion improvements | La Gloria Elementary, Sulphur Springs Elementary |

Note: Most projects with multiple work types are shown in multiple categories.

Traffic data were collected at each school location by a team of three or four observers. Those researchers recorded information on vehicle counts, vehicle speeds, yielding of vehicles to non-motorized traffic and vice versa, and the number of pedestrians and bicyclists both before and after the SR2S project was constructed. Information was also collected on the urban design, or physical character, of the neighborhood surrounding each school, emphasizing aspects of the neighborhood design that might facilitate or impede overall walking.

As part of this research, investigators also surveyed parents of children in the 3rd through 5th grade at each school in the study. The survey was distributed before construction of the SR2S project, to get baseline data on school demographics and child travel patterns to and from school, and again after SR2S construction to measures changes in child travel patterns to or from school. In addition, the survey distributed to 3rd through 5th grade parents after SR2S construction included a battery of questions to assess parental opinion about the effectiveness of the SR2S construction project.

***Expected and Measured Effects***

The research team expected that different SR2S projects would produce different effects. The tables below show the expected impact and measured result for each project. The evaluation hinged in part on whether the measured impacts were consistent with the expected impacts.

## Project Description and Expected Impact

| Project Information | | | Expected Impacts | | | | |
|---|---|---|---|---|---|---|---|
| | | | Walking/Bicycling Impacts | | Traffic Impacts | | |
| Project Type | School | Project Description | Amount | Location | Vehicle Counts | Vehicle Speed | Yielding |
| Traffic Control Devices | Cesar Chavez Elementary | Traffic light replaces 4-way stop sign | + (?) | None | - (?) | - | + |
| Pedestrian/Bicycle Crossing | Glenoaks Elementary | In pavement crosswalk lighting | + (?) | None | None | - [a] | + |
| Pedestrian/Bicycle Crossing | Jasper Elementary | In pavement flashing warning light [b] | + | None | None | - | + |
| Sidewalk Improvements | Juan Cabrillo Elementary | Pathway of decomposed granite with wood curb | + | On sidewalk | None | None | None |
| Pedestrian/Bicycle Crossing | Mt. Vernon Elementary | Pedestrian "countdown" crossing light [c] | + (?) | None | None | None | None |
| Sidewalk Improvement and Bicycle Facilities | Murrieta Elementary | Sidewalk and bicycle path construction | + | On sidewalk | None | None | None |
| Sidewalk Improvements | Sheldon Elementary | Sidewalk gap closures (about 400 feet) | + | On sidewalk | None | None | None |
| Sidewalk Improvements and Pedestrian/Bike Crossing | Valley Elementary | Sidewalk gap closures (3,000 ft.) and crosswalk | + | On sidewalk | None | - (?) | + |
| Sidewalk Improvements | West Randall Elementary | Sidewalk gap closures (about 2,200 feet) | + | On sidewalk | None | None | None |

Notes: "Location" refers to walking only, and whether walking occurs on sidewalk/path or street/shoulder. For location, "on -sidewalk" indicates an expected increase in walking on a sidewalk or path. Yielding refers to yielding of vehicles to pedestrians/bicyclists only. Expected impacts denoted by "?" are less strongly expected.

[a] At Glenoaks, note that traffic at the location of the crosswalk lighting system in front of the school, was congested before the improvement, which reduces the likelihood of further reductions in vehicle speeds.

[b] No traffic signal or 4-way stop was located at this intersection, before or after SR2S project construction. The warning light is in-pavement lighting.

[c] A pre-existing traffic light was located at this intersection. Pedestrian "countdown" light shows time remaining before light changes.

Note that the following project types are represented in the before/after analysis: Sidewalk Improvements, Pedestrian/Bicycle Crossings, Traffic Control Devices, and Bicycle Facilities. Two types of projects are not represented in the before/after analysis: Traffic Calming and Traffic Diversion. The study sites for those two project types (La Gloria, Hawthorne, and Sulphur Springs) had not finished SR2S project construction by the time data were analyzed for this report.

**Project Description and Measured Impact**

| School | SR2S Work Type | Project Description | Evidence of Success | Summary of Measured Results and Comments |
|---|---|---|---|---|
| Cesar Chavez Elementary | Traffic Control Device | Traffic signal at intersection that previously had no signal | Strong evidence of success | Increase in yielding of vehicles to pedestrians; decrease in vehicle speed; in area with high amounts of walking (walk/bike mode split at school approximately 50%) |
| Glenoaks Elementary | Pedestrian/ Bicycle Crossing | In-pavement crosswalk lighting | Strong evidence of success | Increase in yielding of vehicles to pedestrians; pedestrian counts show increase in walking |
| Jasper Elementary | Pedestrian/ Bicycle Crossing | In-pavement crosswalk lighting | No evidence of success | No change in yielding of vehicles to pedestrians; simultaneous opening of I-210 Freeway extension confounds measurement for this project, as I-210 appears to have diverted traffic from SR2S site, which could be associated with the observed increase in vehicle speeds at SR2S site |
| Juan Cabrillo Elementary | Sidewalk Improvement | Walking path | Weak evidence of success | Shift in walking from street/shoulder to path, but little walking was on street or shoulder before SR2S construction; low walking rates (walk/bike mode split from 5% to 7%) and most pedestrians are children and parents who drove to school, park down the street, and then walk into school |
| Mt. Vernon Elementary | Pedestrian/ Bicycle Crossing | Pedestrian warning light at intersection that already had traffic signal | No evidence of success | No change in amount of walking; project's main effect might have been convenience, which is not well measured by the objective outcome indicators summarized here |
| Murrieta Elementary | Sidewalk Improvement and Bicycle Facilities | New sidewalks and on-street bicycle paths | No evidence of success | Very low walking/bicycling amounts before and after SR2S project construction |

| School | SR2S Work Type | Project Description | Evidence of Success | Summary of Measured Results and Comments |
|---|---|---|---|---|
| Sheldon Elementary | Sidewalk Improvement | Sidewalk gap closures | Strong evidence of success | Shift in walking from street/shoulder to path (34% of observed child pedestrians on sidewalk before SR2S project, compared with 65% on sidewalk after SR2S project); fast vehicle speeds on adjacent road (average from 30 to 40 mph) suggests large increase in safety from separation of pedestrians and vehicles; some evidence of increase in amount of walking |
| Valley Elementary | Sidewalk Improvement and Pedestrian/ Bicycle Crossing | Sidewalk gap closures and new crosswalk | Strong evidence of success | Shift in walking from street/shoulder to path (58% of observed child pedestrians on sidewalk before SR2S project, compared with 96% on sidewalk after SR2S project) |
| West Randall Elementary | Sidewalk Improvement | Sidewalk gap closures | Strong evidence of success | Shift in walking from street/shoulder to path (25% of observed child pedestrians on sidewalk before SR2S project, compared with 95% on sidewalk after SR2S project); high levels of walking before and after project; walking increased after SR2S project |

Schools were classified as having strong evidence of success if the measured outcomes corresponded to expected outcomes, if the measured outcomes exceeded the sample error in the survey data or the estimated human error in data collection (as appropriate), if the data provide a consistent indicator of project success, and if the magnitude of impact was reasonably large. The research team found strong evidence of success at five of the nine schools studied (Cesar Chavez Elementary, Glenoaks Elementary, Sheldon Elementary, Valley Elementary, and West Randall Elementary).

Note that the above criteria for success are possibly overly strict. These criteria require that a project produce a near-term, measurable impact that can be observed. Projects that contribute to behaviors that cannot be easily measured but that contribute to safety would not be ranked as a success by these criteria. A simple examination of projects classified as having "strong evidence of success" likely understates the success of the SR2S program. The research team believes that the fact that five of nine projects received a ranking of "strong evidence of success" suggests that the SR2S program on the whole was highly successful. The criterion for overall program success should not be that all SR2S projects deliver immediate and unambiguously measurable impacts, as that would not be possible even in the best of circumstances.

### *Evidence of Success by Work Type*

Among the five sidewalk improvement projects studied, the SR2S sidewalk improvements at three schools (Sheldon, Valley, and West Randall) showed strong evidence of success. In all three cases, the success of the project was based primarily on large improvements in separating pedestrian traffic from vehicle traffic. Of the four schools with pedestrian/bicycle crossing improvements, the SR2S project at two schools (Glenoaks Elementary and Valley Elementary) showed strong evidence of success. The success of the project at Valley Elementary is based more on the sidewalk improvements than on the crosswalk. Thus, the only school where there is strong evidence of success for a pedestrian/bicycle crossing improvement is Glenoaks Elementary. The traffic control device, a traffic signal at Cesar Chavez Elementary, showed strong evidence of success. The only bicycle facility, on-street bicycle paths near Murrieta Elementary, showed no evidence of success. Overall, the most successful work types, based on the data summarized above, appear to be sidewalk gap closures in areas with pre-existing pedestrian traffic or traffic signals in areas with large amounts of both pedestrian or vehicle traffic.

### *Parental Opinion*

The SR2S projects fare very well when measured by parental opinion. Large majorities of parents at all schools noticed the project, stated that the project would increase safety, and had a favorable opinion of the project.

## Conclusions and Recommendations

Given the strong parental approval of the SR2S projects and the encouraging changes in traffic, pedestrian, and bicycle traffic, the research team concludes that the SR2S construction program has been successful in meeting its goals. It is the recommendation of the research team that the SR2S program be continued. Other recommendations include the following:

- Sidewalk gap closures near schools with moderate or high amounts of walking appear to be strong candidates for SR2S funding. Such projects are especially likely to produce increases in pedestrian safety.
- Traffic control projects that regulate yielding at intersections where large volumes of vehicle and pedestrian traffic intersect also are good candidates for SR2S funding.
- At schools where there are low levels of walking or bicycle travel, SR2S construction by itself will likely not be sufficient to increase non-motorized travel to or from school. At such locations, SR2S construction funding should be coupled with more intensive education campaigns or additional construction improvements at the schools to encourage students to walk or bicycle to school.
- In general, schools should be encouraged to leverage SR2S funds by providing education that encourages students to walk and bicycle safely to and from school. Including participation in National Walk to School Day as a criterion for evaluating applications for SR2S funding is one way to couple education more tightly with the construction program.

The research team also recommends that future research should continue to track the outcome of SR2S construction programs. Such research can examine more long-term outcomes of SR2S construction. One example would be studies that would track accident rates, taking advantage of longer time series than were available at the time this evaluation was conducted.

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## INTRODUCTION

This document describes an evaluation of the California Safe Routes to School (SR2S) construction program conduced by the University of California, Irvine under contract to the California Department of Transportation. An expanded version of the contract was made possible by funding from the University of California Transportation Center, through a grant to UC-Irvine. The University of California Transportation Center funds supported an increase in the number of study sites beyond the number funded by the Caltrans contract, including study sites in the San Francisco Bay Area. The principal investigator for this research is Professor Marlon Boarnet in the Department of Planning, Policy, and Design at UC-Irvine, with co-investigators Professor Kristen Day (Department of Planning, Policy, and Design, UC-Irvine) and Dr. Craig Anderson (Health Policy Research, UC-Irvine). Several UC-Irvine students provided assistance throughout this evaluation, including Tracy McMillan, Mariela Alfonzo, Chris Boyko, Gia David, Luis Escobedo, Eric Gage, Jennifer Kunz, Layal Nawfal, Meghan Sherburn, C. Scott Smith, Irene Tang, and Priscilla Thio.

The SR2S program was authorized by AB 1475 in 1999 and reauthorized by SB 10 in 2001. The program provides funding for construction projects near schools, with the intent of increasing pedestrian and bicyclist safety and improving the environment for non-motorized transportation to and from school. This report evaluates the success of the SR2S program, as required by the authorizing legislation. The authorizing legislation required the California Department of Transportation to "study the effectiveness of the program … with particular emphasis on the program's effectiveness in reducing traffic accidents and its contribution to improving safety and reducing the number of child injuries and fatalities in the vicinity of the projects" (Section 2333.5(d) of California Streets and Highway Code, as amended by AB 1475). The re-authorization of the SR2S program in 2001 (SB 10) required the Department of Transportation to submit the study to the legislature by December 31, 2003.

While the legislative intent requires that this study emphasize accident reduction, a study of changes in accident rates resulting from SR2S construction is not yet possible. Pedestrian and bicycle accidents are rare events, and tracking the effect of SR2S construction on accident rates would require a time series of accident data likely extending for several years before and after the project construction. The research team estimated that, at a minimum, two years of accident data would be needed after SR2S construction to accurately assess changes in accident rates that could be attributed to the program. This left few opportunities for study. The first cycle of SR2S funds were allocated in Fall of 2000, such that only the earliest of those projects would have been completed quickly enough to allow a full two years of post-construction observation of accident data. More generally, delays in reporting accident data and the fact that even the first cycle of SR2S projects were not required to sign a construction contract until Fall of

2001 made an analysis of accident data infeasible within the timeframe required to deliver a report by the December 31, 2003 deadline.

For that reason, this study focuses on characteristics of vehicle traffic and pedestrian and bicycle traffic that are associated with pedestrian accidents, rather than on accidents themselves. Presented here are detailed data on nine school sites before and after SR2S construction at those sites. The data here include information on the yielding of vehicles to non-motorized traffic, vehicle counts, and vehicle speeds, all of which can be examined for changes that would correlate with improvements in pedestrian or bicyclist safety. The research team also observed the numbers of child pedestrians and bicyclists, and observed whether those pedestrians/bicyclists used a sidewalk, path, street, or shoulder. These observations provide information on whether the SR2S program contributed to the separation of non-motorized and motorized traffic. In addition, the research team distributed a survey to parents of schoolchildren at selected SR2S schools before and after SR2S project construction. This survey provides more information on changes in children's travel patterns and on parents' perceptions of the effectiveness of the SR2S program and its contributions to pedestrian and bicyclist safety. Lastly, the research team cataloged the urban design near school neighborhoods, to provide information about the context of the built environment near the construction projects as a possible influence on walking.

## Background of SR2S Program

California created the first state-level SR2S construction program in the United States in October 1999, with the signing of California Assembly Bill 1475 (AB1475). The Bill authorized the allocation of $40 million in federal transportation funds over two years to fund projects that were intended to increase the safety and physical activity of child pedestrians and bicyclists on routes to school by altering traffic conditions for vehicles, pedestrians and bicyclists. The program focused on construction projects, as opposed to public information or education. It was supported by a broad coalition of transportation, physical activity, injury and urban design advocates. The original two-year program was re-authorized in 2001 for three more years under California Senate Bill 10.

At the time this report was being prepared, the program had completed three application cycles and approved funding for more than 270 projects. The SR2S program is a "reimbursement program," meaning that successful applicants are reimbursed for their costs in arrears. The maximum reimbursement ratio is 90% with the local agency providing a 10 percent minimum local match. The maximum reimbursement amount for any single project is $450,000. Over $66 million of federal funds have been used to support the program thus far. The number of projects awarded, total project costs, and the federal share of project costs for each funding cycle are outlined in Table 1.

**Table 1: Safe Routes to School Project Awards, 1999-2003**

| | Number of applications | Number of project awards | Total project cost | Federal share |
|---|---|---|---|---|
| **1st cycle (Fall 2000)** | 719 | 85 | $25,150,032 | $19,859,331 |
| **2nd cycle (Fall 2001)** | 520 | 101 | $27,266,117 | $24,328,658 |
| **3rd cycle (Fall 2002)** | 427 | 87 | $28,814,521 | $22,130,419 |
| ***Totals*** | ***1666*** | ***272*** | ***$81,230,670*** | ***$66,318,408*** |

The list of approved projects for the 4th cycle is expected to be released in the fall of 2003. Visit the Caltrans Safe Routes to School Web Site at www.dot.ca.gov/hq/LocalPrograms/saferoute2.htm for additional program information.

The most common types of projects awarded across the first three cycles of SR2S projects were pedestrian/bicycle improvements (e.g., installation or widening of bicycle lanes, crosswalks, flashing beacons and/or traffic signals) and sidewalk improvements (e.g., installation or reconstruction of sidewalks and/or curb ramps). Table 2 contains a breakdown of the projects by improvement type awarded in the first three cycles of SR2S funding.[1]

**Table 2: Summary of California SR2S Projects by Type of Improvement**

| **Type of improvement** | **1st cycle, Fall 2000 N = 85** | **2nd cycle, Fall 2001 N=101** | **3rd cycle, Fall 2002 N=87** |
|---|---|---|---|
| Sidewalk improvements | 45 | 60 | 66 |
| Pedestrian/ bicycle improvements | 55 | 78 | 59 |
| Traffic diversion improvements | 2 | 6 | 2 |
| Traffic calming interventions | 8 | 13 | 10 |

California's SR2S program, based on legislation to support engineering changes, has spawned similar programs in other states, including Oregon, Washington, Texas, and Delaware. Still other localities, such as Tallahassee and Clearview, Florida; Atlanta, Georgia; Chicago, Illinois; and Arlington, Virginia are investing funds in the education of children, parents, and

[1] Most projects contain multiple improvements and/or multiple school sites. Therefore, the number of improvements given in the table exceeds the total number of projects awarded. The table reflects the classification of all proposed improvements.

communities on walking and bicycling safety or in enforcement of traffic laws around schools (Transportation Alternatives, 2002). The National Highway and Traffic Safety Agency (NHTSA) and the Centers for Disease Control and Prevention (CDC) have invested resources in safer, more pedestrian- and bicycle-oriented routes to school in the form of internal and external program dollars. National organizations, such as the Surface Transportation Policy Project, the American Planning Association, and the American Public Health Association, currently advocate for national legislation to support the concept of safe walking and bicycling routes to school.

## METHODS

### *Study Design*

The California SR2S construction program provides a unique oppportunity to observe how changes to the street, sidewalk, and bikeway environment can influence non-motorized travel and pedestrian/bicyclist safety. The research team conducted a pre- and post-evaluation of selected California SR2S sites to determine the effectiveness of physical changes to the local environment in (1) improving the perceived and actual safety of the walk and bicycle trip to school, and (2) enhancing the viability of the walking and bicycling environment.

The research team collected baseline (pre- SR2S project construction) and post- SR2S project construction data for each of sixteen elementary school sites. These "before" and "after construction" data include information about traffic characteristics, walking and bicycling behavior, and perceptions of the safety of non-motorized travel. Three data collection techniques were used: (1) traffic data were collected by teams of observers, (2) the urban environment was measured by observing characteristics of the neighborhoods around study schools, and (3) child travel behavior and parental perceptions were measured through a survey distributed to parents of 3rd through 5th graders at each school studied. Following an initial description of the methods used to select the study sites, each data collection method is described.

Of the sixteen schools studied, full before and after data are only available for nine schools. At the other seven schools, SR2S project construction was not completed in time to be included in this report. Data collection is proceeding at the other schools as soon as construction is complete. A report of those findings will be delivered before the conclusion of the contract in June of 2004.

### *School Site Selection Criteria*

Schools were selected based on the following criteria:

1. School type (elementary/middle/high school): Cycle 1 SR2S projects were overwhelmingly (70%) targeted toward elementary schools. Given this high percentage, a focus on elementary schools was deemed appropriate. Additionally, high schools typically serve students from a wide area, including those outside of feasible walking distance, making the opportunity for students to walk to high schools more limited. In addition, recruiting schools proved to be

exceptionally time-consuming, and including students of different age ranges, such as middle or high-school children, would have required changes to the research design for schools that serve different ages. For these reasons, the study focuses only on elementary schools.

2. School setting: Most of the schools funded in the first two cycles of the SR2S program were located in suburban settings. Even urban schools, such as those in South Central Los Angeles, are classified by the U.S. Census as "urban fringe of a large city." The research team believe that there is variation across a broad range of settings in the sample of schools, including urban settings and more rural settings, but that variation is constrained by the fact that schools served by SR2S project funds were predominantly located in suburban settings.

3. Work type: The SR2S projects included in this overall study represent a cross-section of six work types funded by the SR2S program. The six work types are: sidewalk improvements, traffic calming and speed reduction, pedestrian and bicycle crossing, bicycle facilities, traffic control devices, and traffic diversion improvements. Projects that are typical of each work type include: sidewalk improvements (new sidewalks), traffic calming and speed reduction (speed humps), pedestrian and bicycle crossing (crosswalks or crosswalk improvements), bicycle facilities (bicycle paths, on or off the street), traffic control devices (traffic signals), and traffic diversion improvements (closing streets to traffic to create pedestrian walkways). These are examples of work types, rather than exhaustive list of possible projects in each work type category.

### *School Recruitment*

Recruitment of elementary schools for participation in the research project began in the late fall of 2001/winter of 2002. Recruitment first targeted local agencies from the 1st cycle of SR2S funding. As recruitment occurred one year after the first awards had been announced, many of the 1st cycle SR2S projects would already be complete. Many other projects had not yet begun due to coordination with other related projects; delays in the design, review and bid process; or postponement until summer to minimize impacts on the school environment. The number of SR2S projects that anticipated construction in summer/fall of 2002 was somewhat limited (this construction schedule would allow for pre-construction data collection to occur within a timeframe not too distant from the proposed construction date.) The research team also avoided including in the sample those school sites that ere not yet in the development process of an SR2S project, because of the need to ensure that post-construction data collection would occur within the research timeline.

The research team began to contact local agencies from the 2nd cycle of funding in the spring of 2002, as it became clear that recruitment from the 1st cycle that local agencies would be relatively low, primarily because of construction schedules. Nine schools were recruited from the 2nd SR2S cycle (projects announced in the fall of 2002). It appeared that local agencies were more familiar with the mechanisms of the SR2S funding program in the second year of its existence, which may have reduced the amount of time from project award to construction. Local agencies continued to be sensitive to construction effects on school day activities, so many planned for the majority of construction to occur during a school's off-period (i.e., summer or holiday breaks).

Recruitment of schools to participate in the study continued through the spring, summer and fall of 2002, including local agencies and then schools from both the 1st and 2nd cycle.

In contacting school sites, the research team became aware that many of the schools who were part of an SR2S project were not aware or did not recall the SR2S grant application being submitted by the administration at the school. This issue hampered recruitment at several schools. Low awareness of the SR2S project was likely due to several factors:

- The delay between when the grant was developed and when the actual project began (e.g., grants were written for the 1st cycle in the spring of 2000 and the research team contacted those projects that had not yet been constructed two years later)
- The administrator who was part of the SR2S grant development process was no longer at the school and information about the project was not transmitted to the new administrator
- Communication between the local agency submitting the SR2S grant application (the incorporated city or county where the school was located) and the school was lacking in the period between grant development and project construction. At one location in particular it was not clear whether the school supported the infrastructure improvements that were to be constructed to increase the safety and feasibility of students walking and bicycling to that school. In reviewing grant applications, it was not clear how much each school participated in the project development. At another location, a call by the research team to the school regarding data collection was the school's first indication that construction would be happening near the school within the next month.

The schools included in this study are listed below:

**SR2S Study Sites**

| | City/County | Caltrans District | County | School Name | Improvement |
|---|---|---|---|---|---|
| **1** | City of Bell Gardens | 7 | Los Angeles | Cesar Chavez Elementary | Install traffic signal |
| **2** | City of Chino | 8 | San Bernardino | Newman Elementary | Install traffic signal |
| **3** | City of El Sobrante | 4 | Contra Costa | Sheldon Elementary | Construct sidewalk gap closures |
| **4** | City of Encinitas | 11 | San Diego | Ocean Knoll Elementary | Construct sidewalks |
| **5** | City of Glendale | 7 | Los Angeles | Glenoaks Elementary | Install in-pavement crosswalk signal system to alert approaching vehicles of children in the crosswalks |
| **6** | City of Gonzales | 5 | Monterey | La Gloria Elementary | Install sidewalks and bikeways, traffic signal, signs and pavement markings, traffic calming and traffic diversion |
| **7** | City of Malibu | 7 | Los Angeles | Juan Cabrillo Elementary | Construct pathway of decomposed granite, bordered by wood curb, with appropriate signage |
| **8** | City of Murrieta | 8 | Riverside | Murrieta Elementary | Install bike lanes, sidewalk, curb, gutter |
| **9** | City of Oakland | 4 | Alameda | Hawthorne Elementary | Construct sidewalk bulbout, pedestrian head |
| **10** | City of Rancho Cucamonga | 8 | San Bernardino | Jasper Elementary | Install pedestrian-activated flashing warning signal system |
| **11** | City of San Bernardino | 8 | San Bernardino | Mt. Vernon Elementary | Install traffic signal system |
| **12** | City of Santa Clarita | 7 | Los Angeles | Sulphur Springs Elementary | Construct pedestrian bridge over creek, construct sidewalk |
| **13** | City of South Gate | 7 | Los Angeles | Montara Elementary | Install flashing safety signal for pedestrian crossings, replace deteriorated sidewalk, install new street safety signal at crosswalks, install speed humps |
| **14** | City of Whittier | 7 | Los Angeles | Evergreen Elementary | Construct sidewalk and disabled access ramps around Evergreen Elementary School |
| **15** | City of Yucaipa | 8 | San Bernardino | Valley Elementary | Install sidewalk gap closures |
| **16** | San Bernardino County | 8 | San Bernardino | West Randall Elementary | Install sidewalk gap closures |

These sixteen schools include seven schools from the 1st cycle of SR2S funding, of which one school was in Caltrans District 4, one in District 5, one in District 7, and four in District 8. The study schools also include nine that received funding in the 2nd cycle of the SR2S program, including one school from District 4, five from District 7, two from District 8, and one from District 11. By county, the study schools include one school in each of Alameda, Contra Costa, Monterey, Riverside, and San Diego Counties, five schools in San Bernardino County, and six schools in Los Angeles County.

The work types associated with these school sites are shown below:

| Work Type | Schools |
|---|---|
| Sidewalk improvements | Sheldon Elementary, West Randall Elementary (primarily sidewalks)<br>Murrieta Elementary, Valley Elementary, La G (includes other work types)<br>Juan Cabrillo Elementary, Ocean Knoll Elementary |
| Traffic calming & speed reduction | La Gloria Elementary, Hawthorne Elementary |
| Pedestrian/bicycle crossing | Mt. Vernon Elementary, Jasper Elementary, Valley Elementary, Glenoaks Elementary |
| Bicycle facilities<br>On-street<br>Off-street | La Gloria Elementary, Murrieta Elementary |
| Traffic control devices | Cesar Chavez Elementary, Newman Elementary |
| Traffic diversion improvements | La Gloria Elementary, Sulphur Springs Elementary |

Note: Most projects with multiple work types are shown in multiple categories.

### *Traffic Observation Methods*

Traffic data were collected at each school location by a team of three or four observers. The observations reported here are before construction measurements made at intersections where funded SR2S projects were intended to demonstrate an impact. An observer recorded the number of both child and adult pedestrians and bicyclists at the site, noting the streets crossed by each individual or group were noted. Pedestrians and bicyclists were counted if they crossed at the intersection, passed adjacent to the intersection, or crossed mid-block on a single pre-selected segment.

A second observer recorded yielding behavior of drivers, pedestrians, and bicyclists. That observer classified whether parties (vehicles, pedestrians, or bicyclists) yielded as would be required by the California Vehicle Code. The yielding of vehicles to pedestrians or bicyclists is of particular interest in this study.

A third observer counted vehicles entering the intersection from one direction, or if volume was sufficiently low to permit it, from two directions. The number of vehicles turning right and left from each direction was also recorded.

A fourth observer used a stopwatch to calculate vehicle traffic speeds. A segment of street was chosen that began and ended at least 50 feet from any intersection. The total length of the segment was at least 200 feet, as measured with a measuring wheel. The time required for a vehicle to travel the measured segment was recorded by hand. As soon as the travel time was recorded for one vehicle, another vehicle was identified, timed, and recorded. The results of this method allowed the measurement of average travel times over the segment even when traffic was heavily congested.

Beginning with the tenth school, the same observer recorded both number of pedestrians and bicyclists and yielding behaviors. In the initial data collection at the first nine schools, the research team learned that one observer could easily record both pedestrian and bicyclist counts and yielding behaviors in all but the schools with exceptionally heavy pedestrian traffic. For those schools with heavy pedestrian traffic, a team of four persons was sent to complete the observations after SR2S project construction.

Traffic was observed from 30 minutes before to 15 minutes after the beginning of the school day, and from 15 minutes before to 30 minutes after the end of the school day. All observers recorded two-minute intervals in the raw data. Two ten-minutes periods were then used to summarize the data. The morning off-peak period is the first 10 minutes of morning observations (when traffic near schools is generally low), and the afternoon off-peak period is the final 10-minute of afternoon observations. For both morning and afternoon periods, the peak 10 minutes refers to the 10-minute period during the observations with the highest volume and lowest speed. Note that peaks are reported for vehicle counts, speeds, and pedestrian/bicycle counts. In all cases, the peak is the highest 10-minute period or, for vehicle speeds, the 10-minutes with lowest average speeds. These 10-minute mean vehicle speeds and vehicle, pedestrian, and bicycle counts were averaged over the two days of observation; thus, fractional counts are possible.

### *Urban Design Observation Methods*

Information was collected on the urban design, or physical character, of the neighborhood surrounding each school in the sample, emphasizing aspects of the neighborhood design that might facilitate or impeded overall walking. The research team defined “neighborhood” as the sum of all blocks contained in part or whole within 1/4 mile of the primary school impacted by SR2S construction project being observed. Blocks included both facing sides of the street. Each neighborhood includes a different total number of blocks, depending on its street pattern.

To record, describe, and categorize urban design, data collection teams walked each block within the neighborhood. Observers recorded the presence or absence of urban design elements hypothesized in the literature to be related to walking activity. These elements included features associated with perceived traffic safety; perceived safety from crime; traffic volume, flow or speed; and walkability. Sidewalk and bike lane presence, block length, and street width were measured to address traffic safety. Perceived safety was assessed by noting features such as the percent of houses with windows facing the street and absence of vacant lots or abandoned buildings. The presence of street trees, mixed use, public space and traffic calming measures were recorded as hypothesized livability characteristics suggested to affect walking activity. Information on each block was coded on a separate, two-page survey sheet.

**Definitions of Urban Design Elements Observed**

| **Urban Design Elements Associated with Perceptions of Traffic Safety** | |
|---|---|
| Blocks with a complete sidewalk | Sidewalks present for entire block |
| Blocks with a complete buffered, sidewalk | Sidewalks separated from street by "buffer" (e.g., strip of lawn or landscaping) |
| Blocks with bike lanes | Bike lane is "marked" for entire block (e.g., by painted lines) |
| Blocks with bike lanes separated from the street | Bike lane is "off street" or is otherwise physically separated from car traffic for entire block |

| **Urban Design Elements Associated with Perceived Crime Safety** | |
|---|---|
| Blocks with first floor windows visible from the street | half of the buildings have first floor windows that are visible from the street |
| Blocks with street lighting | One or more public street lighting standards present on block |
| Blocks where abandoned buildings were absent | No obviously abandoned buildings on block (e.g., boarded up buildings) |
| Blocks where rundown buildings were absent | No buildings and/or lots with serious maintenance problems (i.e., bottom 20% of buildings—broken windows, missing porch steps, etc.) |
| Blocks where vacant lots were absent | No undeveloped lots that appear uncared for (e.g., accumulated trash) |
| Blocks where graffiti was absent | No graffiti visible. Any past graffiti painted over |
| Blocks where undesirable land uses were absent | No liquor stores, check cashing stores, pawn shops, bars, or adult movie or book stores |

| **Urban Design Elements Associated with Traffic Volume, Flow or Speed** | |
|---|---|
| Average number of traffic lanes within a block | Number of lanes of car traffic the road accommodates, excluding turning or parking lanes |
| Average street width of a block (in ft.) | Mean of street width for all blocks |

| | |
|---|---|
| Average block length of a block (in ft.) | Mean of block length for all blocks |
| Average sidewalk width of a block (in ft.) | Mean of sidewalk width for all blocks |
| Blocks with traffic circles | One or more intersections have a round-about or traffic circle that diverts traffic in a circular pattern |
| Blocks with bulbout | One or more intersections have a "bulb-out" or extra extension into the street to shorten travel distance for pedestrians and limit lane width for cars. |
| Blocks with speed bumps | Street has one or more "bumps" or other intentional elevations in the road, that are explicitly intended to slow car traffic |
| Blocks with cul-de-sacs | At least one end of street is closed to car traffic by a cul-de-sac or other physical closure of street |
| Blocks with medians | Street has one or more "islands" in the middle. Islands may or may not be landscaped, and may or may not be intended for pedestrian use |
| Blocks with paving treatments | One or more crosswalks is marked with a special paving (e.g., change in color or materials) |
| **Urban Design Elements Associated with Walkability** | |
| Blocks with street trees | Two or more trees are planted in a regular pattern in the public portion of the roadway |
| Blocks with mixed uses | Contains residential as well as one of the following land uses: retail/commercial, office, public, and/or industrial |
| Blocks with public space | Contains one or more open spaces that are not part of a private dwelling (e.g., park) |
| Blocks with street furniture | Contains benches, chairs, or tables for use by the public |

### *Survey Methods*

The study sample for the parent survey consisted of all parents with children in the 3rd through 5th grade attending the participating schools. Sample sizes varied across the schools, based on the number of classrooms and the number of children in each grade. Information about the number of surveys distributed at each school, and the response rate, is provided in the school-by-school summary of results later in this report.

The parent survey was designed to capture information on:

1. Parent's self-report of his or her child's travel to/from school and his or her own walking and bicycling activity in the neighborhood
2. Parent's perception of safety (crime and traffic) for his or her child while walking/bicycling to school
3. Parent's perception of the degree to which neighborhood design features influence his or her own and his or her child's

walking/bicycling behavior (e.g., traffic calming treatments, traffic speed)
4. Parent's perceptions of driving behavior in the neighborhood around the school (both his or her own behavior and the behavior of others)
5. Parent's attitudes towards walking, bicycling and the trip to school
6. Parent's feelings about the social and/or cultural norms about walking, bicycling and the trip to school
7. Demographic questions about the household.

In addition, the survey asked parents to estimate the distance that they live from the schools and length of residence within their neighborhood. Such questions allow some controls for unique characteristics of the neighborhood, such as resident longevity, which may be correlated with travel behaviors. The survey was administered in English and Spanish and designed for completion in approximately 15 minutes. The survey was distributed in the classroom to be sent home and returned through the student. There was no follow-up to capture non-respondents.

In addition to these questions, a survey distributed to 3rd through 5th grade parents after SR2S construction included a battery of questions to assess parental opinion about the effectiveness of the SR2S construction project. The "after construction" survey generally included the same questions as the "before construction" survey, with two additions. The "after construction" survey included a series of questions designed to assess parents' opinions about the SR2S project. These included questions asking whether the parent noticed the project, whether he or she believed the project increased pedestrian or bicyclist safety, and how important he or she believed the construction project was. The "after construction" survey also included questions about parental walking travel, to examine whether linkages exist between parent walking or bicycling and child walking or bicycle travel that might be important for future SR2S projects. In measuring the effect of the SR2S projects, the most important survey questions include changes in the amount of walking or bicycle travel from the "before construction" and "after construction" surveys and the questions on the "after construction" survey that asked parents to assess the SR2S project. Both surveys are included as appendices in this report.

## Introduction to the School-by-School Results

What follows is a summary of results for each of the nine schools. Each section follows the same format, described below.

### *Overview*

After initial descriptive data about the school, the project type is listed. The project type follows the typology used to classify SR2S work types throughout this study: Traffic Control, Pedestrian/Bicycle Crossing, Sidewalk Improvement, Bicycle Facilities, Traffic Diversion, or Traffic Calming. A description of the SR2S project is included in the description of the neighborhood near the school. Each section also includes a map of the neighborhood near the school and photos before and after SR2S project construction.

Study data for each school are then presented. Data on three broad characteristics were collected, including data on the urban design of the neighborhood near the school, observations of vehicle and pedestrian/bicyclist traffic before school starts and after the school day ends, and information from a survey distributed to parents of children in 3rd through 5th grades. Comparing changes in these data before and after SR2S project construction gives insights into the effect of the SR2S project.

For each school, the data are presented in the same order. First, the urban design characteristics of the neighborhood are described in Table 1. This information is mostly contextual, and establishes whether the school is in a neighborhood with characteristics that might generally be conducive or not conducive to walking, bicycling, or non-motorized travel safety (e.g., shorter blocks, no graffiti, etc.). While the urban design data is useful for understanding the context of the SR2S project, many readers will find the information on before/after changes in traffic, pedestrian and bicyclist flows, and survey results more relevant, as those results give more information about the impact of the SR2S project.

### *Traffic Information*

The traffic information begins in Figure 1 and Table 2, which identify vehicle counts before and after the SR2S project construction. Before/after comparisons of vehicle speeds are provided in Figure 2 and Table 3, and yielding of vehicles to pedestrians or bicyclists is described in Figure 5 and Table 6. For all three of these vehicle traffic characteristics—vehicle counts, speeds, and yielding—observations were recorded at the site of SR2S project construction. The report compares results from before and after the SR2S project was built.

For traffic counts (Figure 1 and Table 2), the data are presented for peak and off-peak periods both before and after SR2S project construction. The peak and off-peak periods are defined relative to traffic flows at the school sites, since most schools in the study had noticeable peak traffic flows coinciding with the beginning and end of the school day. Throughout this report, the off-peak period is defined as the last 10 minutes of the morning observation period and the first 10 minutes of the afternoon observation period, when traffic was generally slowest. (In general, morning and afternoon traffic observations spanned 45-minute periods, beginning 30 minutes before school started or ended.) The peak period is the ten-minute period during which vehicle counts were highest. Peaks are defined for both the morning and afternoon observations. The data in the sections that follow show peak and off-peak traffic counts averaged across the two days of observations. (Recall that two days of observations both before and after SR2S project construction were conducted at each school, with few exceptions e.g., Valley Elementary, where rain interfered with one day of after construction observations.)

Vehicle speeds are presented in Figure 2 and Table 3. Vehicle speeds are also shown for peak and off-peak periods, defined in the same way as for traffic counts. Note that the peak vehicle speed period is the 10 minutes when vehicle speeds are at their lowest. (Average vehicle speeds for all 10-minute intervals in an observation period were calculated, and the 10-minute period with lowest average speeds is the peak.) Thus peak period is not the same 10-minute period at each school; instead, peak periods are chosen to illustrate the maximum variation in the data.

Vehicle speeds were calculated by timing vehicles with a stopwatch as the vehicles drove a fixed distance on the street where observations were recorded. In Figure 2, vehicle speeds are reported with error bars. The error bars represent an upper bound for the likely human error involved in starting and stopping the stopwatch. The error bars reflect a 0.3 second error associated with measuring the vehicle travel time. That 0.3-second error was propagated through to the speed calculations, and is reflected in the error bars in Figure 2. The research team believes these error bars represent, if anything, an overestimate of error inherent in the human inaccuracy involved in the speed measurements.

Figure 3 and Table 4 show counts of pedestrians plus bicyclists (all non-motorized traffic) observed at the SR2S site, before and after SR2S project construction. Again, the data are shown for peak and off-peak periods. The peak period is the 10-minute interval with the greatest amount of pedestrian and bicycle traffic. All peak and off-peak values (for traffic counts, speeds, and pedestrian/bicyclist counts) are averaged over the two observation days for both the "before construction" and "after construction" observations.

Figure 4 and Table 5 show the location of pedestrians. The data in Figure 4 and Table 5 refer to pedestrians only – bicyclists are not included in Figure 4 or Table 5. These data show the number of pedestrians (summed over both observation days) that walked exclusively on a sidewalk or path, as opposed to pedestrians walking on the street or on the shoulder of a street. Table 5 also reports the total number of pedestrians observed during the two-day observation period. The data in Figure 4 and Table 5 are summed across morning and afternoon periods for both days, and hence are totals for all observations, with totals reported separately before and after SR2S construction.

Figure 5 and Table 6 report data on yielding of vehicles to pedestrians and bicyclists. Those data only report yielding of vehicles to non-motorized traffic, not yielding of vehicles to other vehicles. The data report the fraction of vehicles that properly yielded to pedestrians or bicyclists before and after the SR2S was constructed.

### *Survey Responses*

The presentation of the survey data begins in Table 7. Table 7 gives basic demographic characteristics of survey respondents before and after the SR2S project was construct. Note that the "before construction" and "after construction" survey responses are data from two different samples. Thus any changes in the survey responses likely indicate differences in the sample of parents who returned surveys in the "before construction" and "after construction" periods. The data in Table 7 can be used for two purposes—to give context about the demographic characteristics of students and parents at the school, and to examine whether the "before construction" and "after construction" samples were similar on key characteristics.

Figure 6 and Table 8 show data on the distance from children's home to school in the "before construction" and "after construction" surveys. These are self-reported distances, which reflect parents' perceptions of how far they live from their children's elementary schools. Large differences in distances in the "before construction" and "after construction" surveys imply that changes in walking or driving from the survey results could be confounded by changes in the distance from home to school among the survey respondents. Thus any changes in mode split data from the surveys (discussed below) should be interpreted in light of the data on self-reported distance to school in the "before construction" and "after construction" surveys.

Figure 7 and Table 9 report mode split for the child's trip to school in the morning. This data presents parents' responses to a survey question about how children travel to school on a typical morning, with mode splits (or percentage of respondents traveling by each transportation mode) reported.

Figure 8 and Table 10 show data on mode split by distance from a child's home to school, based on the parents' survey responses. At most schools, walking and bicycling travel to school declines for distances greater than ½ or, in some cases, ¼ mile from the school. Note that in some cases few children traveled using a particular mode, so percentages in Table 10 should be interpreted in light of the numbers of children who utilized that mode, also shown in Table 10.

Figure 9 and Table 11 reports the association between the SR2S project and children's level of walking. Responses are from a question asking parents whether their children walked or bicycled to school more than, less than, or the same amount now as compared to before SR2S project construction.

Note that this question does not ask parents to assess whether the SR2S project caused changes in walking or cycling. Instead, it simply asks parents to assess whether their children's walking or cycling travel to school changed in the period of time that spanned from before SR2S project construction to after the completion of the project. Figure 9 and Table 11 focus only on respondents who reported changes in walking or bicycling travel, including reported increases and decreases in children's non-motorized travel to school. Changes are reported for two groups of respondents—those who stated that their children would travel past the SR2S project on the way to school, and those who reported that their child would not travel past the SR2S project on the way to school. In general, children who travel past the SR2S project should have larger increases in their non-motorized travel after the construction of the SR2S project.

This comparison controls for factors that might have generally increased or decreased walking or bicycling travel to school during the period of SR2S project construction. Examples of such factors include a highly publicized child abduction and murder that occurred in California between "before construction" and "after construction" observations for some of the schools, and so might have contributed to general decreases in walking or bicycling travel among elementary school children in California. By comparing changes in non-motorized travel by location of the SR2S project relative to children's paths, findings control for broader societal or neighborhood changes in walking and bicycling that might not be associated with the SR2S project.

Lastly, Figures 10-11 and Table 12-13 provide information on parental opinions about the effectiveness and importance of the SR2S construction project.

## Cesar Chavez Elementary School

### I. School location and project description

6139 Loveland St.
Bell Gardens, CA 90201
Contact: Dr. Nicholas D'Amico, Vice Principal
Phone: (323) 773-1804 (general line)
Phone: (323) 887-7900, x5696 (VP direct line)
Fax: (323) 826-5164

Grades K-4
School Population: 1,185
Average class size: 20.7

<u>Ethnic Makeup:</u>
Asian: 0.2%
Hispanic: 99.0%
African American: 0.2%
White: 0.4%
City population (Bell Gardens): 45,650
U.S. Census classification: "Urban fringe of a large city"

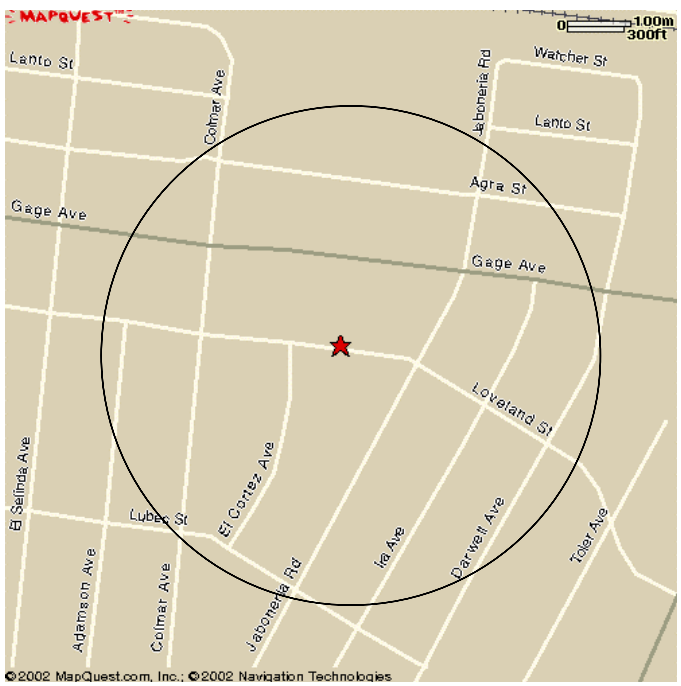
**Dates observed**: 04/24/2002 and 05/01/2002 (before construction); 04/23/2003 and 04/25/2003 (after construction)

**Work Type:** Traffic control

### *Description of the neighborhood*

This neighborhood is urban in character, located within the south central area of Los Angeles. It is built on a traditional grid system and land uses are mixed. While residential density is greater than "suburban" neighborhoods, this neighborhood is still predominantly made up of single-family detached homes. The school is located near a major arterial, Gage Ave.

The project took place on the corner of Loveland Avenue and Jaboneria Road, where there was previously a four-way stop. SR2S funds supported intersection improvement near Cesar Chavez Elementary School, which consisted of upgrading the intersection by installing a traffic signal. The cost of this plus another traffic signal proposed for a second elementary school in the city is $285,000.




Star indicates location of elementary school; Circle represents portion of neighborhood included in the study (approx. ¼ mile radius from the elementary school)

Cesar Chavez Elementary School

Neighborhood Street proximate to Cesar Chavez Elementary School


New traffic signal at Loveland Avenue and Jaboneria Road

Busy street proximate to Cesar Chavez Elementary School

### *Neighborhood characteristics*

Based on before-construction observations of the quarter-mile buffer surrounding Cesar Chavez Elementary, this neighborhood has the following urban design characteristics, which are potentially related to pedestrian activity and traffic safety in the area.

**Table 1: Urban Design Characteristics, Cesar Chavez Elementary School**

| Urban Design Elements Associated with Perceptions of Traffic Safety | |
|---|---|
| **Blocks with a complete sidewalk** | 94% |
| **Blocks with a complete buffered, sidewalk** | 77% |
| **Blocks with bike lanes** | 0% |
| **Blocks with bike lanes separated from the street** | 0% |

| Urban Design Elements Associated with Perceived Crime Safety | |
|---|---|
| **Blocks with first floor windows visible from the street** | 94% |
| **Blocks with street lighting** | 100% |
| **Blocks where abandoned buildings were absent** | 100% |
| **Blocks where rundown buildings were absent** | 89% |
| **Blocks where vacant lots were absent** | 94% |
| **Blocks where graffiti was absent** | 46% |
| **Blocks where undesirable land uses were absent** | 86% |

| Urban Design Elements Associated with Traffic Volume, Flow and Speed | |
|---|---|
| **Average number of traffic lanes within a block** | 2 |
| **Average street width of a block (in ft.)** | 48 |
| **Average block length of a block (in ft.)** | 684 |
| **Average sidewalk width of a block (in ft.)** | 4 |
| **Blocks with traffic circles** | 0% |
| **Blocks with bulbouts** | 0% |
| **Blocks with speed bumps** | 0% |
| **Blocks with cul-de-sacs** | 0% |
| **Blocks with medians** | 0% |
| **Blocks with paving treatments** | 2% |

| Urban Design Elements Associated with Walkability | |
|---|---|
| **Blocks with street trees** | 96% |
| **Blocks with mixed uses** | 65% |
| **Blocks with public space** | 2% |
| **Blocks with street furniture** | 8% |

## II. Traffic analysis

Cesar Chavez Elementary School is located on the northern side of Loveland Street. Vehicle and pedestrian data were gathered along Jaboneria Road at Loveland Avenue on April 24 and May 1, 2002 (pre-construction) and April 23 and April 25, 2003 (post-construction). Morning and afternoon observation periods (45-minutes each) commenced at 7:45 a.m. and 2:15 p.m. respectively, and coincide with the peak flows of school traffic.

### *Vehicle counts*

Figure 1 plots the combined volume of east- and west-bound traffic along Loveland Street for both the morning and afternoon, pre- and post-construction periods. *Off-peak* values represent the total number of vehicles observed over the last 10 minutes of the morning period or the first 10 minutes of the afternoon period. These periods typically coincide most closely with traffic patterns outside of school drop off and pick up times. *Peak* values represent the sum of vehicles counted over the 10-minute period with the greatest traffic volume.

In the *before* construction period, the a.m. off-peak count was 125 cars in the 10 minute period. This value decreased after the construction of the SR2S project, to 156. Likewise, the a.m. peak count was 140 cars before construction, which dropped to 163 after construction of the project. These patterns held for afternoon off-peak values, increasing from 94 to 99, and peak values that increased from 155 to 189 after the SR2S project was implemented.

These distributions indicate that a.m. peak traffic volumes were comparable to the p.m. counts, however the a.m. off-peak values were slightly greater than the p.m. off-peak counts. Vehicle counts experienced gains across all categories after the traffic signal was installed: a.m. off-peak increased 25 percent, a.m. peak increased 16 percent, p.m. off-peak increased 5 percent and p.m. peak increased 22 percent (Table 2).

**Figure 1: Vehicle Counts, Cesar Chavez Elementary School**

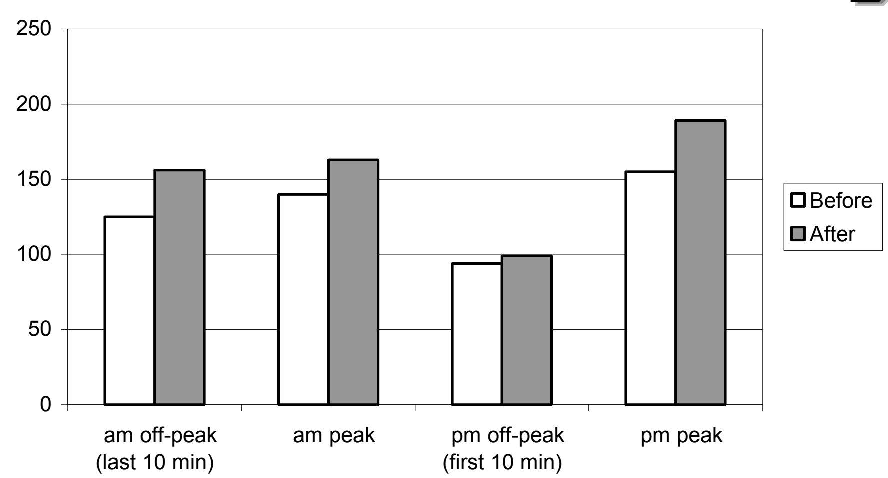



**Table 2: Vehicle Counts, Cesar Chavez Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 125 | 156 | 25% |
| **a.m. peak** | 140 | 163 | 16% |
| **p.m. off-peak** | 94 | 99 | 5% |
| **p.m. peak** | 155 | 189 | 22% |

### *Vehicle speeds*

Like vehicle counts, average vehicle speeds are reported with respect to off-peak values, that is, the average speeds observed over the last ten minutes of the morning period and the first ten minutes of the afternoon period. Off-peak vehicle speeds more closely reflect average velocities for non-drop off and pick-up hours. *Peak period* velocities—the lowest ten-minute mean speeds averaged over the two-day observation period—are also provided for the morning and afternoon, pre- and post-construction periods. The error bars are based on an assumed human accuracy of +/- 0.3 seconds in both the start and stop time used to calculate speed measurements. The researchers believe this is, if anything, an overestimate of the human inaccuracy involved in the speed measurements.

Unlike the vehicle counts, vehicle speeds actually decreased across all categories after installation of the traffic signal. For example, off-peak speeds along Loveland Street in the morning observation period fell from 24.15 mph in the pre-construction period to 22.52 mph after construction (a decrease of 7 percent). Similarly, the peak a.m. average velocities before and after project construction marginally decreased from 16.49 mph to 16.31 mph (1 percent). Afternoon off-peak speeds also fell from 22.15 mph before construction to 20.84 mph (6 percent) after project construction. Likewise, the peak p.m. velocities slipped 19 percent from a pre-construction velocity of 20.50 mph to a post-construction 16.65 mph (Table 3).

**Figure 2: Average Vehicle Speeds, Cesar Chavez Elementary School**

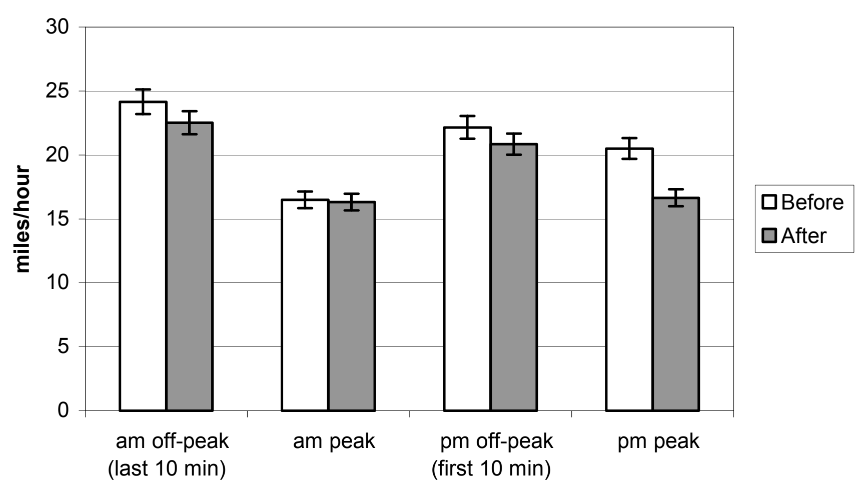



**Table 3: Average Vehicle Speeds, Cesar Chavez Elementary School**

| | Before (mph) | After (mph) | % Change |
|---|---|---|---|
| **a.m. off-peak** | 24.15 | 22.52 | -7% |
| **a.m. peak** | 16.49 | 16.31 | -1% |
| **p.m. off-peak** | 22.15 | 20.84 | -6% |
| **p.m. peak** | 20.50 | 16.65 | -19% |

### *Pedestrian and cyclist counts*

*Off-peak* and *peak* count measures are reported for combined pedestrian and cyclist traffic and averaged over a two-day period. Figure 3 plots these values for Cesar Chavez Elementary School. At 37.0, the off-peak a.m. count was slightly higher than the off-peak p.m. count of 29.5, however the former increased 43 percent after construction while the latter decreased 53 percent. The post-construction, peak values were greater in both the morning (121.5) and afternoon (350.0) periods compared to the pre-construction values of 107.5 and 283.0, respectively.

Off-peak counts show a considerable amount of pedestrian and cyclist activity, with the peak period occurring in the afternoon. Most promising is that pedestrian and cyclist activity, with respect to the peak values, escalated in both the morning (increase of 13 percent) and afternoon (increase of 24 percent) periods after implementation of the SR2S construction project (Table 4).

**Figure 3: Child Pedestrian and Cyclist Counts, Cesar Chavez Elementary School**

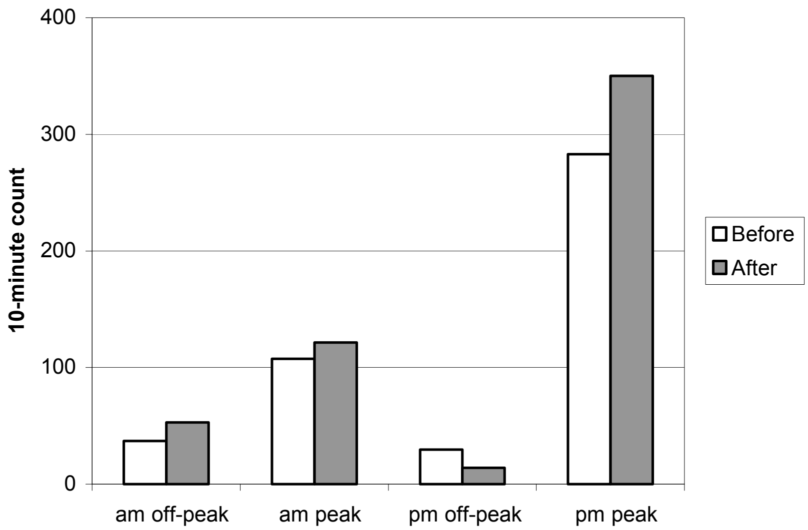



**Table 4: Child Pedestrian and Cyclist Counts, Cesar Chavez Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 37.0 | 53.0 | 43% |
| **a.m. peak** | 107.5 | 121.5 | 13% |
| **p.m. off-peak** | 29.5 | 14.0 | -53% |
| **p.m. peak** | 283.0 | 350.0 | 24% |

### *Locations of pedestrians*

Researchers monitored the locations of pedestrians relative to the sidewalk or street during 45-minute, morning and afternoon observation periods.

Figure 4 plots the number of pedestrians who used either: (1) a sidewalk and/or path separated from the street; or (2) a street and/or street shoulder.

Table 5 shows that most child pedestrians utilized a sidewalk or path to get to and from school while only a small number (a total of 11 in both the pre- and post-construction observation periods) used only the street shoulder or street during their journey to school. However, the number of child pedestrians that used only a sidewalk or path decreased 7 percent, falling from 2,193 to 2,036 after the traffic signal was installed. Overall, the total number of pedestrians dropped 7 percent from a pre-construction value of 2,204 to a post-construction value of 2,047.

**Figure 4: Child Pedestrian Locations, Cesar Chavez Elementary School**


**Table 5: Locations of Child Pedestrians, Cesar Chavez Elementary School**

| | **Before** | **After** | **% Change** |
|---|---|---|---|
| **Sidewalk or path only** | 2,193 | 2,036 | -7% |
| **Shoulder or street** | 11 | 11 | 0% |
| ***Total child pedestrians*** | ***2,204*** | ***2,047*** | ***-7%*** |

### *Yielding behavior*

The final facet of the traffic analysis was to document whether automobile drivers adequately yield to pedestrians and cyclists. This behavior was indicated with a basic yes or no: the former specifies that the driver obeyed traffic laws, and waited, if obligated, for the pedestrian or cyclist to proceed safely across the intersection, and the latter suggests that the driver encroached on the pedestrian's path, thereby forcing the person to yield to the motorized vehicle. Figure 5 shows that 95 percent of the observed drivers (584 of 612) yielded appropriately during the before project construction observation period, while 100 percent of the 205 refereed motorists fully yielded to pedestrians and cyclists after construction (Table 6).

**Figure 5: Yielding Behavior, Cesar Chavez Elementary School**

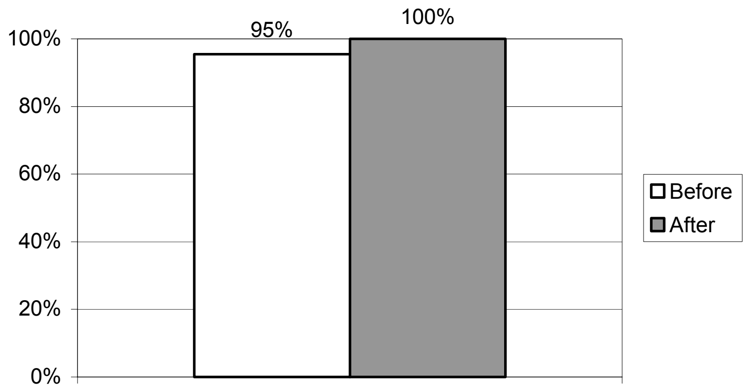



**Table 6: Yielding Behavior, Cesar Chavez Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Yielded** | 584 (95%) | 205 (100%) | 5% |
| **Did not yield** | 28 (5%) | 0 (0%) | -5% |
| ***Total*** | ***612*** | ***205*** | |

## III. Survey results

The final section of this report focuses on parents' responses to take-home surveys that were distributed before and after project construction. The surveys solicited demographic information such as household size, employment status, and household income, as well as numerous transportation-related responses. Parents were asked to identify the transportation mode their child uses for their journey to and from school, their feelings of the SR2S infrastructure project, and whether or not the construction is likely to change their children's travel behavior. A total of 251 (56.00 percent) pre-construction and 207 post-construction surveys (48.80 percent) were completed by parents of Cesar Chavez Elementary School students. A summary of these responses is provided below.

### *Demographic information*

Table 7 summarizes demographic attributes gleaned from the pre- and post-construction survey responses. The investigators wish to emphasize that the before and after values were drawn from two different surveys and two different samples. Therefore, the percentage change of these variables should be interpreted more as a measure of variation between the samples rather than a real change in the population's characteristics.

**Table 7: Demographic Characteristics of Households, Cesar Chavez Elementary School**

| | Before | After | Change |
|---|---|---|---|
| ***Average age of child for whom survey was completed*** | 8.95 | 8.94 | -0.10 |
| ***Sex of child (% female)*** | N/A | 48.31% | N/A |
| ***Average grade of child*** | 3.46 | 3.65 | 0.19 |
| ***Percentage of population living with spouse or significant other*** | 69.32% | 74.88% | 5.56% |
| ***Average number of persons in house*** | 5.51 | 4.14 | -1.37 |
| ***Average number of persons between 6 and 16 years of age*** | 2.22 | 2.19 | -0.03 |
| ***Average number of licensed drivers in household*** | 1.65 | 1.60 | -0.05 |
| ***Average number of cars in household*** | 1.66 | 1.65 | -0.01 |
| ***Average number of persons working full- or part-time*** | 1.46 | 1.48 | 0.02 |
| ***Average number of persons working 20 hours per week or more*** | 1.46 | 1.43 | -0.05 |
| ***Average number of years parent in school*** | 9.05 | 9.55 | 0.50 |
| ***Annual Household Income*** | | | |
| **$15,000 or less** | 80 (31.87%) | 63 (30.43%) | -17 (-1.44%) |
| **$15,001 to $35,000** | 97 (38.65%) | 84 (40.58%) | -13 (1.93%) |
| **$35,001 to $55,000** | 37 (14.74%) | 25 (12.08%) | -12 (-2.66%) |
| **$55,001 to $75,000** | 6 (2.39%) | 8 (3.86%) | 2 (-1.47%) |
| **$75,001 or more** | 4 (1.59%) | 3 (1.45%) | -1 (-0.14%) |
| **No response** | 27 (10.76%) | 24 (11.59%) | -3 (0.84%) |
| ***Years living in neighborhood*** | | | |
| **Under 1 year** | 23 (9.16%) | 16 (7.73%) | -7 (-1.43%) |
| **1 to 5 years** | 94 (37.45%) | 68 (32.85%) | -26 (-4.60%) |
| **6 to 10 years** | 58 (23.11%) | 50 (24.15%) | -8 (1.05%) |
| **Over 10 years** | 52 (20.72%) | 49 (23.67%) | -3(2.95%) |
| **Whole life** | 12 (4.78%) | 13 (6.28%) | 1 (1.50%) |
| **No response** | 12 (4.78%) | 11 (5.31%) | -1 (0.53%) |
| ***Years living in U.S.*** | | | |
| **Under 1 year** | 4 (1.59%) | 0 (0.00%) | -4 (-1.59%) |
| **1 to 5 years** | 17 (6.77%) | 11 (5.31%) | -6 (-1.46%) |
| **6 to 10 years** | 20 (7.97%) | 19 (9.18%) | -1 (1.21%) |
| **Over 10 years** | 165 (65.74%) | 93 (44.93%) | -72 (-20.81%) |
| **Whole life** | 37 (14.74%) | 69 (33.33%) | 32 (18.59%) |
| **No response** | 8 (3.19%) | 15 (7.25%) | 7 (4.06%) |
| ***Born in U.S. (%)*** | 14.34% | 14.98% | 0.63% |

The demographic characteristics suggest that the average age and grade of the child for whom the survey was completed were about 9 years old before and after SR2S construction.  Approximately 75 percent of the parents reported that they lived with a significant other (i.e. husband/wife or boyfriend/girlfriend) and an about 1.5 persons in each household worked full- or part-time.  About half of the respondents have lived in their present neighborhood for over five years and 16.33 percent have lived in the U.S. ten years or less.

Students of Cesar Chavez Elementary are from relatively large households (an average of 4.14 persons after project construction), with an average 1.65 cars and 1.60 licensed drivers.  Over 70 percent of households reported a modest annual income of $35,000 or less and the parents were in school an average 10 years.

### *Distance from School*

Before project construction, 55.77 percent of parents responded that they lived less than one mile away from their child's school (see Figure 6 and Table 8). About 6 percent lived more than 1 mile away and 38.65 percent did not know or did not answer the question. After project construction, the percentage of parents who responded that they lived less than one mile away increased to 3.65 percent, to 59.42 percent. Accordingly, the percentage of parents responding that they lived more than one mile away decreased by about 1 percent, to 4.35 percent. The percentage of respondents who did not know or who did not respond decreased by about 2 percent, to 36.23 percent.

**Figure 6.  Distances From School, Cesar Chavez Elementary School**

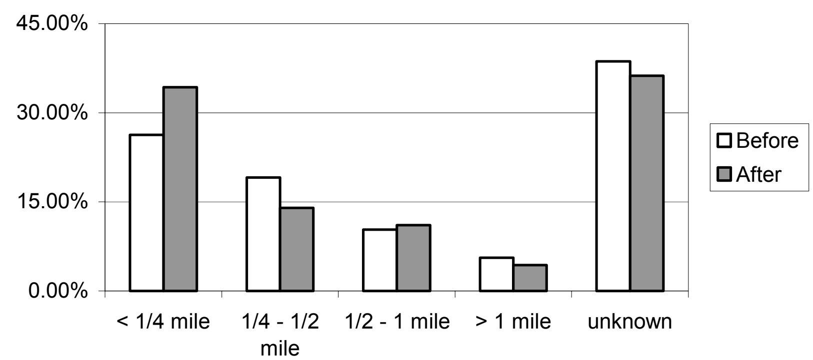



**Table 8. Distances From School, Cesar Chavez Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **< 1/4 mile** | 66 (26.29%) | 71 (34.30%) | 5 (8.00%) |
| **1/4 mile–1/2 mile** | 48 (19.12%) | 29 (14.01%) | -19 (-5.11%) |
| **1/2 mile–1 mile** | 26 (10.36%) | 23 (11.11%) | -3 (0.75%) |
| **> 1 mile** | 14 (5.58%) | 9 (4.35%) | -5 (-1.23%) |
| **Missing/Other** | 97 (38.65%) | 75 (36.23%) | -22 (-2.41%) |

### *Transportation mode splits*

Figure 7 charts the share of each transportation mode utilized for the children's commutes to school. From the figure, it can be discerned that the private vehicle is the dominant mode of transport. Approximately 44.22 percent of the children represented in the survey were driven to school in a private automobile in the pre-construction period and 50.24 percent in the post-construction period. Bus and transit represent a minimal share of pre- and post-construction commutes (0.00 percent and 1.45 percent, respectively). The combined share of those who walked or bicycled amounted to 51.00 percent in the pre-construction period compared with 45.89 percent post-construction, a decrease of 5.10 percent (Table 9).

**Figure 7: Transportation Mode Splits for Commutes to School, Cesar Chavez Elementary School**

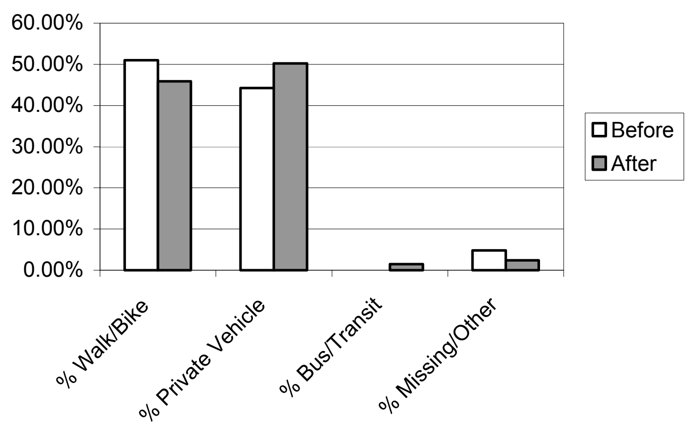



**Table 9: Transportation Mode Splits for Commutes to School, Cesar Chavez Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Walk/bike** | 128 (51.00%) | 95 (45.89%) | -33 (-5.10%) |
| **Private vehicle** | 111 (44.22%) | 104 (50.24%) | -7 (6.02%) |
| **Bus/transit** | 0 (0.00%) | 3 (1.45%) | 3 (1.45%) |
| **Missing/other** | 12 (4.78%) | 5 (2.42%) | -7 (-2.37%) |

### *Transportation mode splits by distance from school*

A cross-tabulation of transportation mode by distance from school suggests that location is associated with the likelihood that a child walks or bicycles to school (Figure 8). For example, 43 of the 65 surveyed children who walked to Cesar Chavez Elementary after the project was constructed lived within a quarter-mile of the school's campus and only three of these individuals lived over one mile from school. The share of students that commuted by private vehicle was also lower for families living within a quarter-mile of school (35.21 percent) when compared to children living over a mile from school (44.44 percent). The private vehicle share was 64.29 percent for children living between a quarter-mile and a half-mile from school and 60.87 percent for those living between a half-mile and one mile from school (Table 10).

**Figure 8: Transportation Mode Splits for Commutes to School by Distance from School , Cesar Chavez Elementary School**

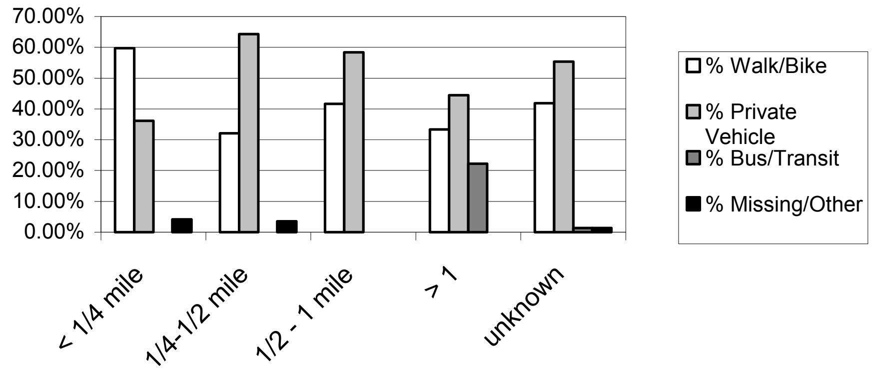



**Table 10: Transportation Mode Splits for Commutes to School by Distance from School , Cesar Chavez Elementary School**

| | < 1/4 mile | ¼-1/2 mile | 1/2 - 1 mile | > 1 mile | unknown |
|---|---|---|---|---|---|
| **Walk/bike** | 43 (60.56%) | 9 (32.14%) | 9 (39.13%) | 3 (33.33%) | 31 (41.89%) |
| **Private vehicle** | 25 (35.21%) | 18 (64.29%) | 14 (60.87%) | 4 (44.44%) | 41 (55.41%) |
| **Bus/transit** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 2 (22.22%) | 1 (1.35%) |
| **Missing/other** | 3 (4.23%) | 1 (3.57%) | 0 (0.00%) | 0 (0.00%) | 1 (1.35%) |

### *Location of SR2S construction project relative to survey respondents*

Survey results reveal a gain of 18 children who walk to school more often after implementation of the SR2S project, and 20 children who walk or bicycle less often. Fourteen of the 25 children (7.11 percent) whose usual route to school coincides with the SR2S project, walked to school more often than before the traffic signal was in place, while 5.58 percent of these children walked less. In contrast, only 4 of the 13 children (2.03 percent) whose usual route did not coincide with the sidewalk construction walked more, while 9 (4.57 percent) walked less (Figure 9 and Table 11).

**Figure 9: Project Along Usual Route vs. Percentage Walked, Cesar Chavez Elementary School**

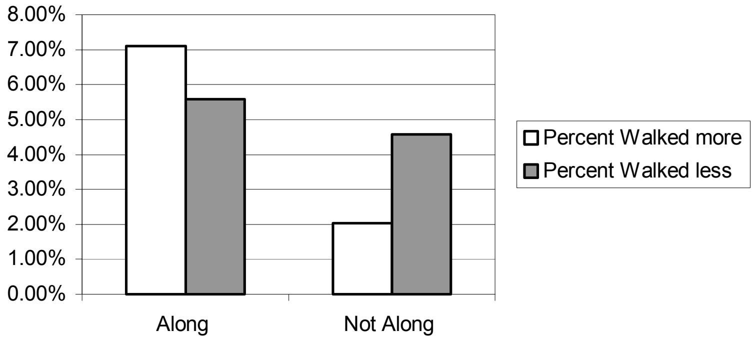



**Table 11: Project Along Usual Route vs. Percentage Walked, Cesar Chavez Elementary School**

| | Along Route | Not Along Route |
|---|---|---|
| **Percent walked more** | 14 (7.11%) | 4 (2.03%) |
| **Percent walked less** | 11 (5.58%) | 9 (4.57%) |

### *Parents' perceptions of effects of SR2S construction project*

The Cesar Chavez after-construction survey also collected information concerning the parents' perceptions of the project's effects. A vast majority of parents feel that the project produced favorable results such as slowing traffic (83.09 percent), easing street crossings (88.89 percent), separating children from cars (71.50 percent), and making motorists more aware of children along the road (81.64 percent). In general, 85.02 percent of the surveyed parents feel the project enhances safety for child pedestrians and bicyclists (Figure 10 and Table 12).

**Figure 10: Perceived Effects of Project, Cesar Chavez Elementary School**

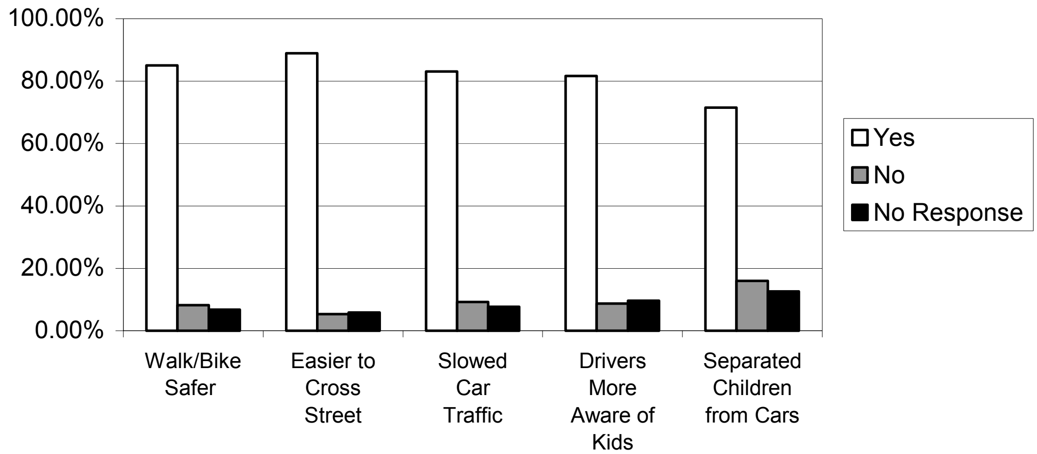



**Table 12: Perceived Effects of Project, Cesar Chavez Elementary School**

| | Yes | No | No Response |
|---|---|---|---|
| **Walk/bike safer** | 176 (85.02%) | 17 (8.21%) | 14 (6.76%) |
| **Easier to cross street** | 184 (88.89%) | 11 (5.31%) | 12 (5.80%) |
| **Slows car traffic** | 172 (83.09%) | 19 (9.18%) | 16 (7.73%) |
| **Drivers more aware of children** | 169 (81.64%) | 18 (8.70%) | 20 (9.66%) |
| **Separates children from cars** | 148 (71.50%) | 33 (15.94%) | 26 (12.56%) |

### *Parents' perceptions of importance of SR2S construction project*

The final part of this section briefly outlines the parents' perceptions of the importance of the SR2S project. Figure 10 shows that 36.71 percent of the respondents feel the project is the single most important construction project that could have been built while 39.61 percent believe that it was among the few most important construction projects that could have been built. Only 2 of the 173 parents that responded to this question (less than 1 percent) felt that the project was not at all important (Table 13).

**Figure 11: Perceived Importance of Project, Cesar Chavez Elementary School**

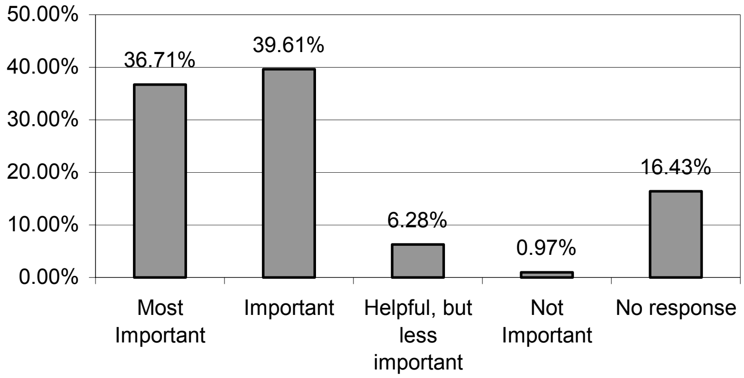



**Table 13: Perceived Importance of Project, Cesar Chavez Elementary School**

| | |
|---|---|
| **Most Important** | 76 (36.71%) |
| **Important** | 82 (39.61%) |
| **Helpful, but less important** | 13 (6.28%) |
| **Not Important** | 2 (0.97%) |
| **No reponse** | 34 (16.43%) |

## Glenoaks Elementary School

### I. School location and project description

2015 E. Glenoaks Blvd.
Glendale, CA 91206
Contact: Robert Modrzejewski, Principal
Phone: (818) 242-3747
Fax: (818) 247-4423

Grades: K-6
School Population: 654
Average class size: 22.3

Ethnic Makeup:
Asian: 18.3%
Hispanic: 18.5%
African American: 1.7%
White: 48.3%
City population (Glendale): 199,000
U.S. Census Classification: "Urban fringe of a large city"

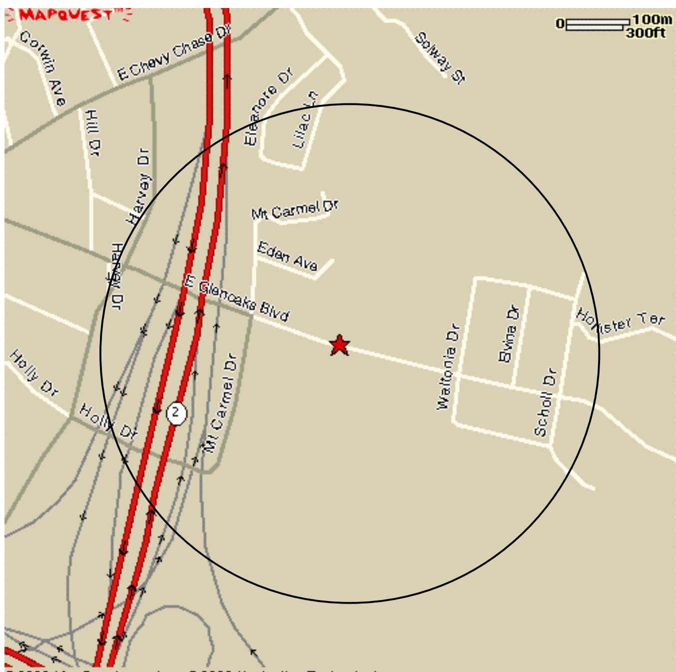
**Date Observed:** 09/09/02 and 09/10/02 (before construction); 04/30/03 and 05/02/03 (after construction)

**Work Type:** Pedestrian crossing improvements

### *Description of the neighborhood*

This neighborhood within the City of Glendale is a suburban/urban community located in Los Angeles. The neighborhood includes primarily residential land uses. It follows a suburban land use pattern with curvilinear streets. The neighborhood is divided by a highway overpass, which clearly separates it into two distinct districts (a single-family, higher income neighborhood and a multi-family, middle to lower income neighborhood).

The SR2S construction improvement was located on Glenoaks Boulevard between Mt. Carmel Road and Waltonia Drive. The project installed a pedestrian-activated, in-pavement crosswalk lighting system. The installation was proposed to cost $396,000.




Star indicates location of elementary school; Circle represents portion of neighborhood included in the study (approx. ¼ mile radius from the elementary school)


Glenoaks Elementary School


Glenoaks Boulevard before installation of crosswalk lighting system


New pedestrian-activated, in-pavement crosswalk lighting system on Glenoaks Boulevard


Neighborhood proximate to Glenoaks Elementary School

### ***Neighborhood characteristics***

Based on before-construction observations of the quarter mile area surrounding Glenoaks Elementary School, this neighborhood has the following urban design characteristics, which are potentially related to pedestrian activity and traffic safety in the area.

**Table 1: Urban Design Characteristics, Glenoaks Elementary School**

| | |
|---|---|
| ***Urban Design Elements Associated with Perceptions of Traffic Safety*** | |
| **Blocks with a complete sidewalk** | 36% |
| **Blocks with a complete buffered, sidewalk** | 15% |
| **Blocks with bike lanes** | 0% |
| **Blocks with bike lanes separated from the street** | 0% |
| ***Urban Design Elements Associated with Perceived Crime Safety*** | |
| **Blocks with first floor windows visible from the street** | 73% |
| **Blocks with street lighting** | 93% |
| **Blocks where abandoned buildings were absent** | 96% |
| **Blocks where rundown buildings were absent** | 96% |
| **Blocks where vacant lots were absent** | 95% |
| **Blocks where graffiti was absent** | 93% |
| **Blocks where undesirable land uses were absent** | 91% |
| ***Urban Design Elements Associated with Traffic Volume, Flow and Speed*** | |
| **Average number of traffic lanes within a block** | 2 |
| **Average street width of a block (in ft.)** | 40 |
| **Average block length of a block (in ft.)** | 467 |
| **Average sidewalk width of a block (in ft.)** | 5 |
| **Blocks with traffic circles** | 0% |
| **Blocks with bulbouts** | 0% |
| **Blocks with speed bumps** | 4% |
| **Blocks with cul-de-sacs** | 13% |
| **Blocks with medians** | 0% |
| **Blocks with paving treatments** | 0% |
| ***Urban Design Elements Associated with Walkability*** | |
| **Blocks with street trees** | 54% |
| **Blocks with mixed uses** | 5% |
| **Blocks with public space** | 4% |
| **Blocks with street furniture** | 9% |

## II. Traffic analysis

Glenoaks Elementary School is located on Glenoaks Boulevard. The SR2S improvement occurred on Glenoaks Boulevard between Mt. Carmel Road and Waltonia Drive. Pre-construction vehicle and pedestrian data were gathered along Glenoaks Blvd on September 9 and September 10, 2002. Post-construction vehicle data were gathered on April 30 and May 2, 2003. Morning and afternoon observation periods (45-minute each) commenced at

7:45 a.m. and 2:15 p.m. respectively, which coincide with the peak flows of school traffic.

### *Vehicle counts*

Figure 1 plots the combined volume of traffic along Glenoaks Boulevard (both directions in front of the school) for the morning and afternoon, pre- and post-construction periods. *Off-peak* values represent the total number of vehicles observed over the last 10 minutes of the morning period or the first ten minutes of the afternoon period (these periods typically coincide most closely with traffic patterns outside of school drop off and pick up times). *Peak* values represent the sum of vehicles counted over the 10-minute period with the greatest traffic volume.

Morning off-peak counts before construction included 67.0 vehicles and morning peak counts included 242.5 vehicles. Afternoon off-peak counts before construction included 81.0 vehicles and afternoon peak counts included 124.5 vehicles. After construction of the SR2S project, morning off-peak and peak counts decreased, to 61.0 and 211.0 vehicles, respectively. Afternoon off-peak counts both increased, however, to 84.5 and 170.5, respectively.

These findings seem to suggest no clear impact of the SR2S construction improvement on vehicle counts near Glenoaks Elementary School. This conclusion is supported by the fact that the construction improvement itself—a pedestrian-activated, in-pavement crosswalk lighting system—is not obviously intended to impact overall vehicle counts (Table 2).

**Figure 1: Vehicle Counts, Glenoaks Elementary School**

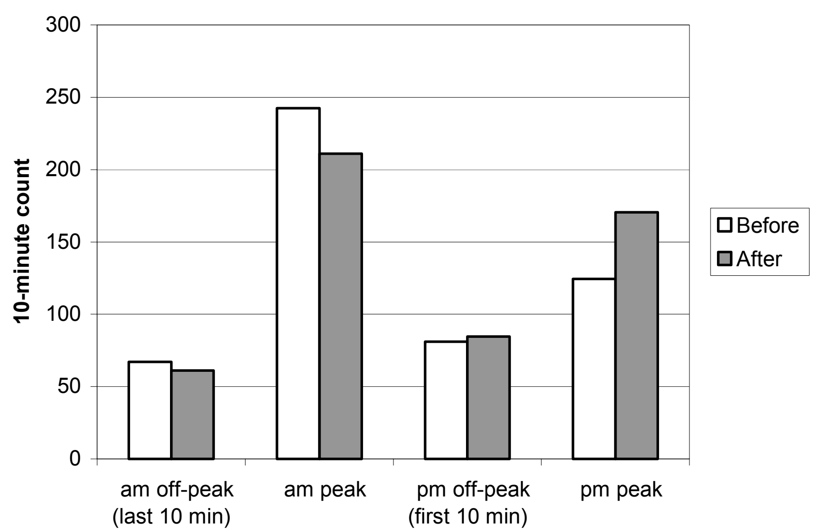


**Table 2: Vehicle Counts, Glenoaks Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **am off-peak** | 67.0 | 61.0 | -9% |
| **am peak** | 242.5 | 211.0 | -13% |
| **pm off-peak** | 81.0 | 84.5 | 4% |
| **pm peak** | 124.5 | 170.5 | 37% |

### *Vehicle speeds*

Like vehicle counts, average vehicle speeds are reported with respect to off-peak values, that is, the average speeds observed over the last ten minutes of the morning period and the first ten minutes of the afternoon period, when vehicle speeds are typically closest to those for non-drop off and pick-up hours. *Peak period* speeds, the ten-minute period with the lowest average speed, are also provided for the morning and afternoon, pre- and post-construction phases. Figure 2 reports these values with 1/3-second error bars (indicated by brackets at the top of each column in the chart). The error bars are based on an assumed human accuracy of +/- 0.3 seconds in both the start and stop time used to calculate speed measurements. The investigators believe this is, if anything, an overestimate of the human accuracy involved in the speed measurements.

Vehicle speeds before and after construction changed little, with slight increases in three of the four categories measured. Before construction, morning off-peak speeds were 25.5 mph, and morning peak speeds were 11.7 mph. Afternoon off-peak speeds were 24.9 mph and afternoon peak speeds were 14.5 mph. After construction of the SR2S project, morning off-peak speeds decreased to 24.5 mph and morning peak speeds increased to 13 mph. Afternoon off-peak vehicle speeds post-construction increased to 26.2 mph, and afternoon peak vehicle speeds increased to 16.2 mph. The SR2S construction project was expected to reduce vehicle speeds at the specific intersection where the in-pavement crosswalk lighting system was installed (Table 3).

**Figure 2: Average Vehicle Speeds, Glenoaks Elementary School**

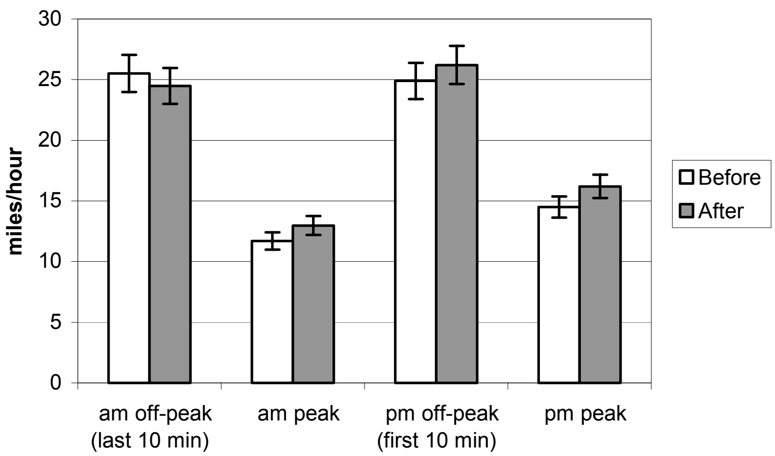



**Table 3: Average Vehicle Speeds, Glenoaks Elementary School**

| | Before (mph) | After (mph) | % Change |
|---|---|---|---|
| **a.m. off-peak** | 25.50 | 24.50 | -4.% |
| **a.m. peak** | 11.70 | 13.00 | 11% |
| **p.m. off-peak** | 24.90 | 26.20 | 5% |
| **p.m. peak** | 14.50 | 16.20 | 12% |

### *Pedestrian and cyclist counts*

*Off-peak* and *peak* count measures are reported for pedestrian and cyclist traffic. Figure 3 plots these values for Glenoaks Elementary School.

Pedestrian and cyclist counts increased for three of the four categories measured, between pre and construction observation periods. Before construction, counts included a total of 2.5 pedestrians and bicyclists in the morning off-peak period, and a total of 70.5 pedestrians and bicyclists in the morning peak period. Similarly, afternoon counts pre-construction included a total of 4.0 pedestrians and cyclists in the off-peak period, and a total of 74.5 pedestrians and bicyclists in the peak period. After construction of the SR2S improvement, morning off-peak counts increased to 8.50 pedestrians and bicyclists, and morning peak counts increased to 94.00 pedestrians and cyclists—an increase of 33 percent. Afternoon counts decreased to 3.0 pedestrians and cyclists, but afternoon peak counts increased to 184.0 pedestrians and cyclists—an increase of 147percent.

The consistent and sizable increases in peak counts of child pedestrians and bicyclists suggest that the pedestrian activated crosswalk may have played a role in increasing child walking and bicycling at this site (Table 4).

**Figure 3: Child Pedestrian and Cyclist Counts, Glenoaks Elementary School**

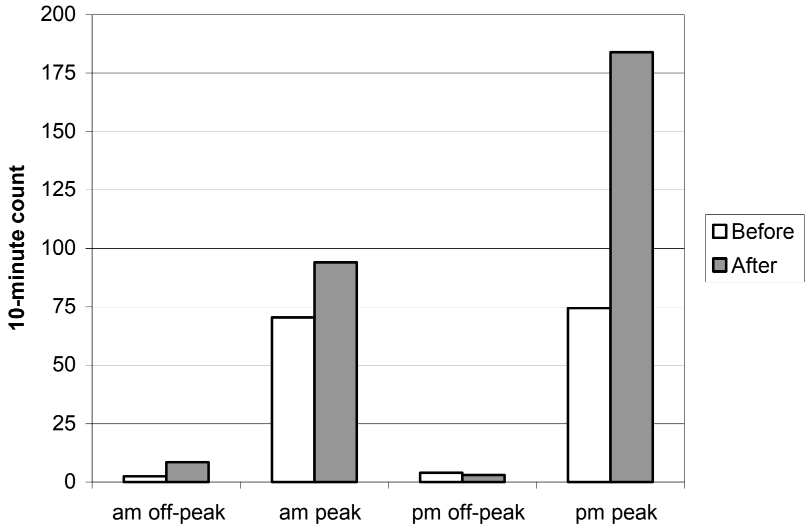



**Table 4: Child Pedestrian and Cyclist Counts, Glen Oaks Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 2.5 | 8.5 | 240% |
| **a.m. peak** | 70.5 | 94.0 | 33% |
| **p.m. off-peak** | 4.0 | 3.0 | -25% |
| **p.m. peak** | 74.5 | 184.0 | 147% |

### *Locations of pedestrians*

The location of walking activity (relative to the sidewalk or street) was observed during the 45-minute morning and afternoon observation periods. Figure 4 reports the number of pedestrians who were observed on: (1) sidewalks (paved surfaces separated from the street); (2) paths (non-paved surfaces separated from the street); (3) street shoulders; and (4) directly on streets. Note that pedestrians were counted multiple times if they utilized more than one type of walkway.

The total numbers of pedestrians observed before and after construction increased substantially, from a total of 148 pedestrians before construction to a total of 974 pedestrians after construction—an increase of 558 percent. However, the percentage of pedestrians walking on the shoulder or street decreased by 75 percent.  This change is somewhat surprising, as the pedestrian crosswalk improvement that was installed was not designed to address this issue directly (Table 5).

**Figure 9: Locations of Child Pedestrians, Glenoaks Elementary School**

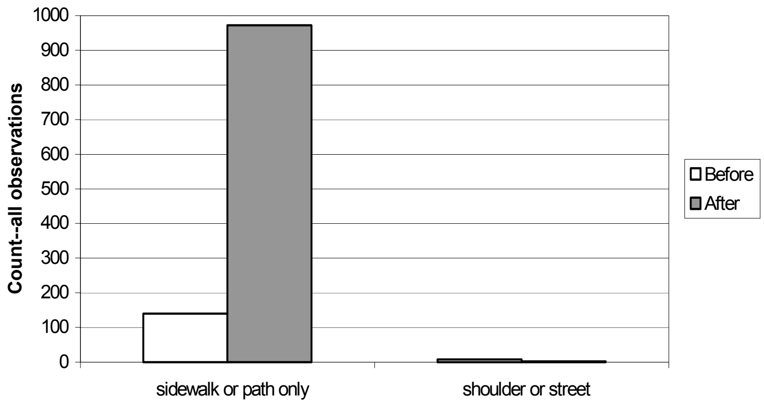



**Table 5: Locations of Child Pedestrians, Glenoaks Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **Sidewalk or path only** | 140 | 972 | 594% |
| **Shoulder or street** | 8 | 2 | -75% |
| ***Total child pedestrians*** | ***148*** | ***974*** | ***558%*** |

### *Yielding behavior*

The traffic analysis documented whether automobile drivers adequately yielded to pedestrians and cyclists. This behavior was indicated with a simple yes or no: the former specifies that the driver obeyed traffic laws, and waited, if obligated, for the pedestrian or cyclist. The latter suggests that the driver encroached on another's path when he or she was legally obligated to yield.

Appropriate yielding behavior was high both before and after the SR2S construction project. Yielding did increase, however, after construction, rising from 94 percent of observations (before) to 98 percent of observations (after). This finding would be consistent with the objective of the pedestrian activated crosswalk, which is designed to increase the visibility of pedestrians in the crosswalk to drivers, and hence to encourage appropriate yielding for pedestrians (Figure 5 and Table 6).

**Figure 5: Yielding Behavior, Glenoaks Elementary School**

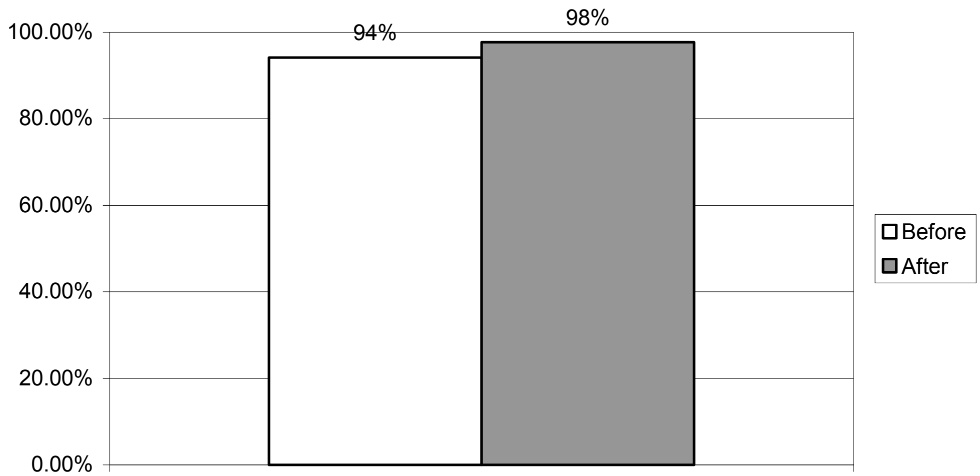



**Table 6: Yielding Behavior, Cesar Chavez Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Yielded** | 225 (94%) | 128 (98%) | -43% |
| **Did not yield** | 14 (6%) | 3 (2%) | -79% |
| ***Total*** | ***239*** | ***131*** | |

## III. Survey results

This section of the analysis examines parents' responses to take-home surveys that were distributed before and after project construction. The surveys solicited demographic information such as household size, employment status, and household income, as well as numerous transportation-related responses. Parents were asked to identify the transportation mode their child uses for their journey to and from school, parents' assessment of the SR2S construction project, and whether or not the construction project was likely to change their children's travel behavior. A total of 209 pre-construction surveys (72.00 percent response rate) and 142 post-construction surveys (57.00 percent response rate) were completed by parents of Glenoaks Elementary School students. A summary of these responses is provided below.

### *Demographic information*

Table 7 describes the households that completed the survey. The investigators wish to emphasize that the before and after values were drawn from two different surveys and two different samples. Therefore, the percentage change of these variables should be interpreted more as a measure of variation between the samples rather than a real change in the population's characteristics.

| Table 7: Demographic Characteristics of Households, Glenoaks Elementary . | Before | After | Change |
|---|---|---|---|
| ***Average age of child for whom survey was completed*** | 9.29 | 9.64 | 0.35 |
| ***Sex of child (% female)*** | 51.20% | 59.03% | 7.83% |
| ***Average grade of child*** | 4.38 | 4.08 | -0.3 |
| ***Percentage of population living with spouse or significant other*** | 79.90% | 83.80% | 3.90% |
| ***Average number of persons in household*** | 4.32 | 4.28 | -0.04 |
| ***Average number of persons between 6 and 16 years of age*** | 1.82 | 1.77 | -0.05 |
| ***Average number of licensed drivers in household*** | 1.97 | 2.18 | 0.21 |
| ***Average number of cars in household*** | 2.00 | 2.16 | 0.16 |
| ***Average number of persons working full- or part-time*** | 1.59 | 1.64 | 0.05 |
| ***Average number of persons working 20 hours per week or more*** | 1.53 | 1.68 | 0.15 |
| ***Average number of years parent in school*** | 14.35 | 14.68 | 0.33 |
| **Annual Household Income** | | | |
| **$15,000 or less** | 18 (8.61%) | 17 (11.97%) | -1 (3.36%) |
| **$15,001 to $35,000** | 37 (17.70%) | 14 (9.86%) | -23 (-7.84%) |
| **$35,001 to $55,000** | 43 (20.57%) | 26 (18.31%) | -17 (-2.26%) |
| **$55,001 to $75,000** | 31 (14.83%) | 29 (20.42%) | -2 (5.59%) |
| **$75,001 or more** | 64 (30.62%) | 44 (30.99%) | -20 (0.36%) |
| **No response** | 16 (7.66%) | 12 (8.45%) | -12 (0.80%) |
| **Years living in neighborhood** | | | |
| **Under 1 year** | 19 (9.09%) | 16 (11.27%) | -3 (2.18%) |
| **1 to 5 years** | 69 (33.01%) | 48 (33.80%) | -21 (.79%) |
| **6 to 10 years** | 56 (26.79%) | 36 (25.35%) | -20 (-1.44%) |
| **Over 10 years** | 60 (28.71%) | 26 (18.31%) | -34 (-10.40%) |
| **Whole life** | 5 (2.39%) | 11 (7.75%) | 6 (5.35%) |
| **No response** | 0 (0.00%) | 5 (3.52%) | 5 (3.52%) |
| **Years living in U.S.** | | | |
| **Under 1 year** | 3 (1.44%) | 1 (0.70%) | -2 (-0.73%) |
| **1 to 5 years** | 15 (7.18%) | 11 (7.75%) | -4 (0.57%) |
| **6 to 10 years** | 10 (4.78%) | 3 (2.11%) | -7 (-2.67%) |
| **Over 10 years** | 102 (48.80%) | 82 (57.75%) | -20 (8.94%) |
| **Whole life** | 78 (37.32%) | 40 (28.17%) | -38 (-9.15%) |
| **No response** | 1 (0.48%) | 5 (3.52%) | -4 (3.04%) |
| ***Born in U.S. (%)*** | 40.67% | 29.58% | 11.09% |

Overall, more than 60 percent of respondents were not born in the US, though most have lived in the US for more than 10 years. Respondents in the after construction survey were more likely to live in households with more cars and more licensed drivers, compared to respondents in the before construction survey. Also, after survey respondents were more likely to be completing the survey in reference to female children (59.03 percent compared with 51.20 percent of before survey respondents). After survey respondents were also less likely to have been born in the US compared to before survey respondents.

### *Distance from school*

Respondents in the before construction survey were much more likely to live within a half mile to school, compared to respondents in the after construction survey. In fact, 42.11 percent of before construction survey respondents lived within quarter mile of school, and a total of 80.9 percent before construction survey respondents lived within half mile of school. Only 0.96 percent of before construction survey respondents lived more than a mile from school. These figures compare to 11.27 percent of after construction survey respondents who lived within quarter mile of school, 32.40 percent of whom lived within half mile of school and 26.76 percent of whom lived over a mile from school. The differences in these samples suggest that, based on distance alone, respondents in the before construction survey would find it much easier for children to walk to school, compared to respondents in the after construction survey (see Figure 6 and Table 8).

**Figure 6. Distances From School, Glenoaks Elementary School**

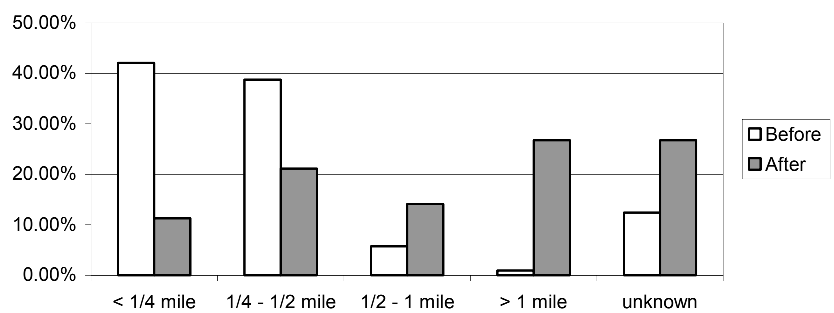



**Table 8. Distances From School, Glenoaks Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **< 1/4 mile** | 88 (42.11%) | 16 (11.27%) | -72 (-30.84%) |
| **1/4 mile–1/2 mile** | 81 (38.76%) | 30 (21.13%) | -51 (-17.63%) |
| **1/2 mile–1 mile** | 12 (5.74%) | 20 (14.08%) | 8 (8.34%) |
| **> 1 mile** | 2 (0.96%) | 38 (26.76%) | 36 (25.80%) |
| **Missing/Other** | 26 (12.44%) | 38 (26.76%) | 12 (14.32%) |

### *Transportation mode splits*

Most children of survey respondents traveled to school by private vehicle, both before (78.95 percent) and after (87.32 percent) the construction of the SR2S project. Respondents reported that their children were more likely to be driven by a private vehicle and were less likely to walk or bicycle to school after construction of the SR2S project , compared to respondents in the before construction survey. This difference is not surprising, given the large differences between the two samples in distance to school, discussed above. In fact, given these differences, one might expect to find an even lower percentage of children walking or bicycling to school in the after construction survey (Figure 7 and Table 9).

**Figure 7: Transportation Mode Splits for Commutes to School, Glenoaks Elementary School**

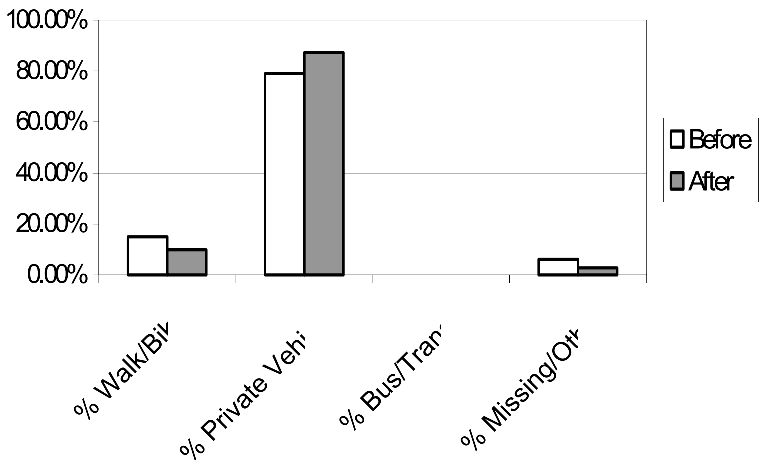



**Table 9: Transportation Mode Splits for Commutes to School, Glenoaks Elementary School**

| | Before | After | Change |
|---|---:|---:|---:|
| **Walk/bike** | 31 (14.83%) | 14 (9.86%) | -17 (-4.97%) |
| **Private vehicle** | 165 (78.95%) | 124 (87.32%) | -41 (8.38%) |
| **Bus/transit** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **Missing/other** | 13 (6.22%) | 4 (2.82%) | -9 (-3.40%) |

### *Transportation mode splits by distance from school*

Among respondents who lived within quarter mile of school, children were equally likely to walk or bicycle to school as be driven in a private vehicle (50.00 percent each). Among all those who lived more than a quarter mile from school, however, children were most likely to arrive at school via private vehicle. No children in the sample walked more than a mile to school, and no children used bus or transit to travel to school.

**Figure 8: Transportation Mode Splits for Commutes to School by Distance from School, Glenoaks Elementary School**

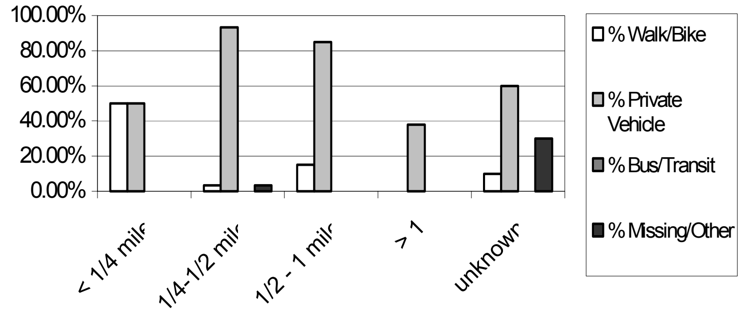



**Table 10: Transportation Mode Splits for Commutes to School by Distance from School, Glenoaks Elementary School**

| | < 1/4 mile | 1/4-1/2 mile | 1/2 - 1 mile | > 1 mile | unknown |
|---|---|---|---|---|---|
| **Walk/bike** | 8 (50.00%) | 1 (3.33%) | 3 (15.00%) | 0 (0.00%) | 1 (10.00%) |
| **Private vehicle** | 8 (50.00%) | 28 (93.33%) | 17 (85.00%) | 38 (38.00%) | 6 (60.00%) |
| **Bus/transit** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **Missing/other** | 0 (0.00%) | 1 (3.33%) | 0 (0.00%) | 0 (0.00%) | 3 (30.00%) |

Location of SR2S construction project relative to survey respondent
Respondents were asked to indicate whether children walked more or less after the construction of the SR2S project. A total of 8.09 percent of respondents reported that their children walked more after project construction, and 12.50 of respondents reported that their children walked less after project construction. Those or whom the SR2S project was along their route to school were more likely to walk more after construction and were less likely to walk less after construction, compared to those for whom the project was not along their route to school.

**Figure 9: Project Along Usual Route vs. Percentage Walked, Glenoaks Elementary School**

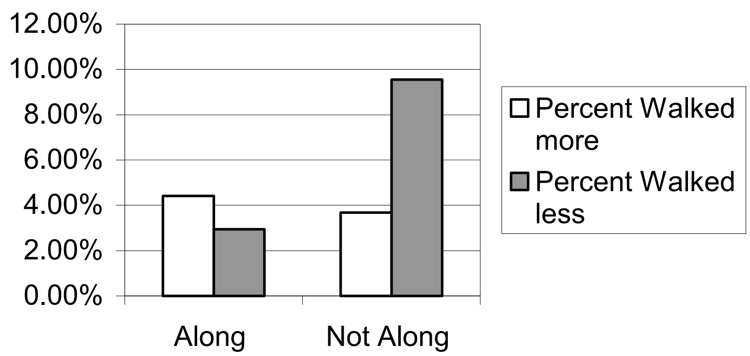


**Table 11. Project Along Usual Route vs. Percentage Walked, Glenoaks Elementary School**

| | Along Route | Not Along Route |
|---|---|---|
| **Percent walked more** | 6 (4.41%) | 4 (3.68% |
| **Percent walked less** | 5 (2.94%) | 13 (9.56%) |

### *Parents' perceptions of effects of SR2S construction project*

Parents and guardians positively evaluated the effects of the SR2S construction project, especially in terms of its effects on making it easier to cross the street (83.80 percent), making drivers more aware of children (83.80 percent), making walking and bicycling safer (77.46 percent), and slowing car traffic (75.35 percent). All of these effects are consistent with the objectives of pedestrian activated lighted crosswalk systems. Somewhat fewer respondents felt that the project was successful in separating children from cars (63.38 percent), which is arguably not a specific intention of this type of safety feature.

**Figure 10: Perceived Effects of Project, Glenoaks Elementary School**

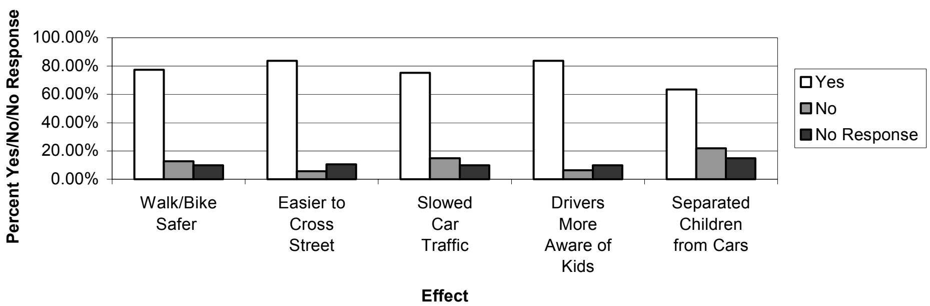



**Table 12: Perceived Effects of Project, Glenoaks Elementary School**

| | Yes | No | No Response |
|---|---|---|---|
| **Walk/bike safer** | 110 (77.46%) | 18 (12.68%) | 14 (9.86%) |
| **Easier to cross street** | 119 (83.80%) | 8 (5.63%) | 15 (10.56%) |
| **Slows car traffic** | 107 (75.35%) | 21 (14.79%) | 14 (9.86%) |
| **Drivers more aware of children** | 119 (83.80%) | 9 (6.34%) | 14 (9.86%) |
| **Separates children from cars** | 90 (63.38%) | 31 (21.83%) | 21 (14.79%) |

Parents' perceptions of importance of SR2S construction project

A majority of parents and guardians (70.42 percent) evaluated the SR2S construction project as either "important" or as the "most important" safety construction project in the neighborhood. An additional 19.01 percent of respondents characterized the project as "helpful but less important," and few respondents (2.11 percent) characterized the project as "not important."

These findings would seem to suggest that the selection of this project was consistent with the neighborhood safety priorities of most Glenoaks parents.

**Figure 11: Perceived Importance of Project, Glenoaks Elementary School**

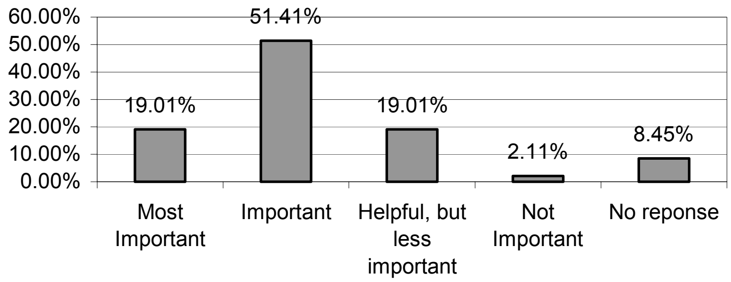



**Table 13: Perceived Importance of Project, Glenoaks Elementary School**

| | |
|---|---|
| **Most Important** | 27 (19.01%) |
| **Important** | 73 (51.41%) |
| **Helpful, but less important** | 27 (19.01%) |
| **Not Important** | 3 (2.11%) |
| **No response** | 12 (8.55%) |

## Jasper Elementary School

### I. School location and project description

6881 Jasper St.
Alta Loma, CA 91701
Contact: Mary Ann Burke, Principal
Phone: (909) 484-5050

Grades: K-6
School Population: 614
Average class size: 24

Ethnic Makeup:
Asian: 1.8%
Hispanic: 22.6%
African American: 7.3%
White: 62.1%
City population (Alta Loma): 51, 341
U.S. Census Classification: "Urban fringe of a large city"

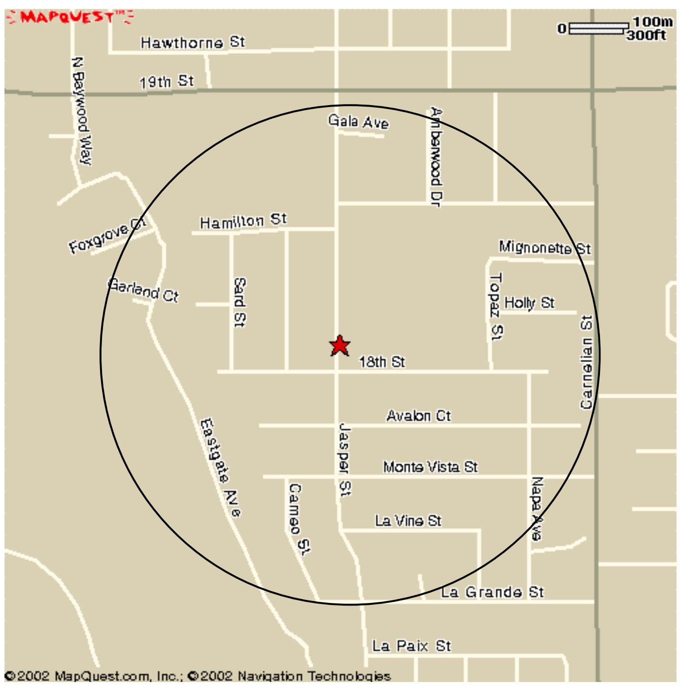
**Dates observed**: 05/15/2002 and 05/17/2002 (before construction); 05/28/2003 and 05/30/2003 (after construction)

**Work Type:** Pedestrian crossing improvements

### *Description of the neighborhood*

This neighborhood is located in the City of Rancho Cucamonga. It is a suburban, bedroom community of Los Angeles, Orange and San Bernardino Counties. It consists of solely residential land uses. The neighborhood follows a primarily suburban land use pattern with longer blocks and curvilinear streets, and has only three to four entry/exit points from the major arterials bordering the neighborhood. A major four-lane arterial with traffic speeds posted at 50mph lies within a quarter-mile radius of school.

The project took place at the intersection of 19th Street and Jasper Street. Although 19th Street is a major arterial, Jasper is a quiet, residential street, and does not generate enough traffic to warrant a traffic signal or a four-way stop. Instead, an in-pavement crosswalk lighting system was installed, in which a pedestrian activates a set of flashing lights embedded in the roadway around the pedestrian crossing, alerting drivers of their presence. The proposed cost of the lighting system and installation is $30,000.




Star indicates location of elementary school; Circle represents portion of neighborhood included in the study (approx. ¼ mile radius from the elementary school)

Jasper Elementary School

19th Street before crosswalk improvement


19th Street crosswalk after installation of in-pavement lighting


Neighborhood street proximate to Jasper Elementary School

### *Neighborhood characteristics*

Based on before-construction observations of the quarter-mile buffer surrounding Jasper Elementary, this neighborhood has the following urban design characteristics, which are potentially related to pedestrian activity and traffic safety in the area.

**Table 1: Urban Design Characteristics, Jasper Elementary School**

| | |
|---|---|
| **Urban Design Elements Associated with Perceptions of Traffic Safety** | |
| **Blocks with a complete sidewalk** | 57% |
| **Blocks with a complete buffered, sidewalk** | 57% |
| **Blocks with bike lanes** | 0% |
| **Blocks with bike lanes separated from the street** | 0% |
| **Urban Design Elements Associated with Perceived Crime Safety** | |
| **Blocks with first floor windows visible from the street** | 91% |
| **Blocks with street lighting** | 100% |
| **Blocks where abandoned buildings were absent** | 93% |
| **Blocks where rundown buildings were absent** | 93% |
| **Blocks where vacant lots were absent** | 93% |
| **Blocks where graffiti was absent** | 93% |
| **Blocks where undesirable land uses were absent** | 94% |
| **Urban Design Elements Associated with Traffic Volume, Flow and Speed** | |
| **Average number of traffic lanes within a block** | 2 |
| **Average street width of a block (in ft.)** | 38 |
| **Average block length of a block (in ft.)** | 636 |
| **Average sidewalk width of a block (in ft.)** | 5 |
| **Blocks with traffic circles** | 2% |
| **Blocks with bulbouts** | 3% |
| **Blocks with speed bumps** | 2% |
| **Blocks with cul-de-sacs** | 32% |
| **Blocks with medians** | 2% |
| **Blocks with paving treatments** | 2% |
| **Urban Design Elements Associated with Walkability** | |
| **Blocks with street trees** | 59% |
| **Blocks with mixed uses** | 6% |
| **Blocks with public space** | 0% |
| **Blocks with street furniture** | 0% |

## II. Traffic analysis

Jasper Elementary School is located on the western side of Jasper Street, a two-lane local road. Vehicle and pedestrian data were gathered along 19th Street at Jasper Street on May 15 and May 17, 2002 (pre-construction) and May 28 and May 30, 2003 (post-construction). Morning and afternoon observation periods (45-minutes each) commenced at 7:30 a.m. and 2:15 p.m. respectively, and coincide with the peak flows of school traffic.

### *Vehicle counts*

Figure 1 plots the combined volume of east- and west-bound traffic along 19th Street for both the morning and afternoon, pre- and post-construction periods. *Off-peak* values represent the total number of vehicles observed over the last 10 minutes of the morning period or the first 10 minutes of the afternoon period. These intervals typically coincide most closely with traffic patterns outside of school drop off and pick up times. *Peak* values represent the sum of vehicles counted over the 10-minute period with the greatest traffic volume.

In the before construction period, the off-peak value for the morning count was 199 cars in the 10 minute period. This value decreased after the construction of the SR2S project, to 152. Likewise, the peak value for the morning count was 294 cars before construction, which dropped to 233 after installation of the in-pavement lights. The afternoon off-peak values also decreased, falling from 202 to 151, after the SR2S project was implemented. The peak values for afternoon counts experienced a similar pattern, dropping from 208 to 161 due primarily to pick ups.

All vehicle counts dropped after implementation of the SR2S project. The a.m. and p.m. off-peak traffic volumes were nearly identical for the pre- and post-construction observation periods and a.m. peak values were considerably higher than the p.m. values (Table 2).

**Figure 1: Vehicle Counts, Jasper Elementary School**

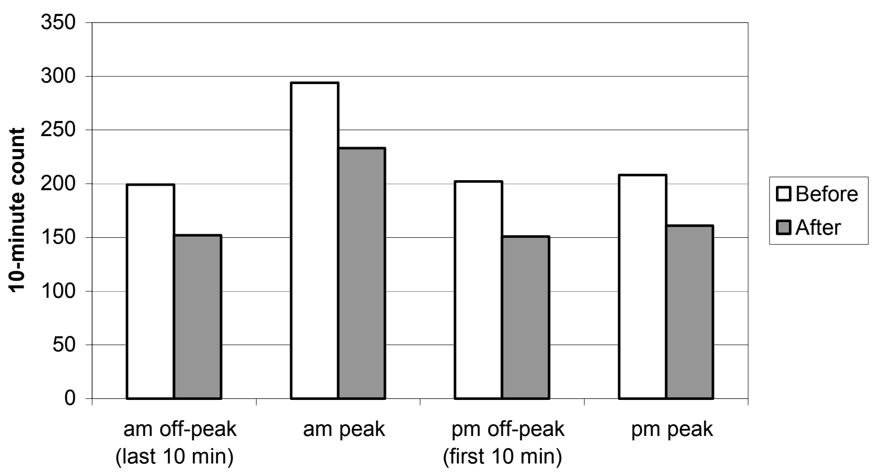



**Table 2: Vehicle Counts, Jasper Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 199 | 152 | -24% |
| **a.m. peak** | 294 | 233 | -21% |
| **p.m. off-peak** | 202 | 151 | -25% |
| **p.m. peak** | 208 | 161 | -23% |

### *Vehicle speeds*

Like vehicle counts, average vehicle speeds are reported with respect to off-peak values, that is, the average speeds observed over the last ten minutes of the morning period and the first ten minutes of the afternoon period. Off-peak vehicle speeds more closely reflect average velocities for non-drop off and pick-up hours. *Peak period* velocities—the lowest ten-minute mean speeds averaged over the two-day observation period—are also provided for the morning and afternoon, pre- and post-construction periods. The error bars in Figure 2 are based on an assumed human accuracy of +/- 0.3 seconds in both the start and stop time used to calculate speed measurements. The researchers believe this is, if anything, an overestimate of the level of human inaccuracy involved in the speed measurements.

Off-peak speeds on 19th Street in the morning observation period increased from 41.88 mph in the pre-construction period to 51.35 mph after construction (an increase of 23 percent). Similarly, the peak a.m. average velocities before and after project construction increased from 36.79 mph to 40.85 mph (11 percent). Afternoon off-peak speeds increased from 41.73 mph before construction to 47.45 mph (14 percent) after project construction. The peak p.m. velocities increased 17 percent from 39.43 mph (pre-construction) to a post-construction average speed of 45.94 mph (Table 3).

**Figure 2: Average Vehicle Speeds, Jasper Elementary School**

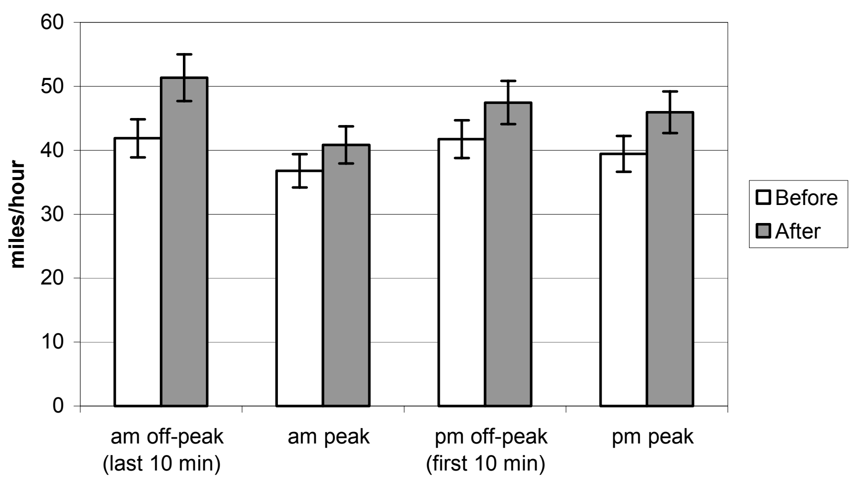



**Table 3: Average Vehicle Speeds, Jasper Elementary School**

| | Before (mph) | After (mph) | % Change |
|---|---|---|---|
| **a.m. off-peak** | 41.88 | 51.35 | 23% |
| **a.m. peak** | 36.79 | 40.85 | 11% |
| **p.m. off-peak** | 41.73 | 47.45 | 14% |
| **p.m. peak** | 39.43 | 45.94 | 17% |

### *Pedestrian and cyclist counts*

*Off-peak* and *peak* count measures are reported for combined pedestrian and cyclist traffic and averaged over a two-day period. Figure 3 plots these values for Jasper Elementary School. No students were observed over the final 10 minutes of the pre- and post-construction morning observation periods and few students were seen walking or cycling over the two day pre- and post-construction p.m. period. The pre-construction peak values were less in the morning (6.5) and afternoon (13.0) periods compared to their corresponding post-construction values of 4.5 and 9.0.

Off-peak counts show a minimal amount of pedestrian and cyclist activity, with the most substantial activity occurring in the afternoon. Overall, pedestrian and cyclist activity experienced a slight drop-off after implementation of the SR2S construction project (Table 4).

**Figure 3: Child Pedestrian and Cyclist Counts, Jasper Elementary School**

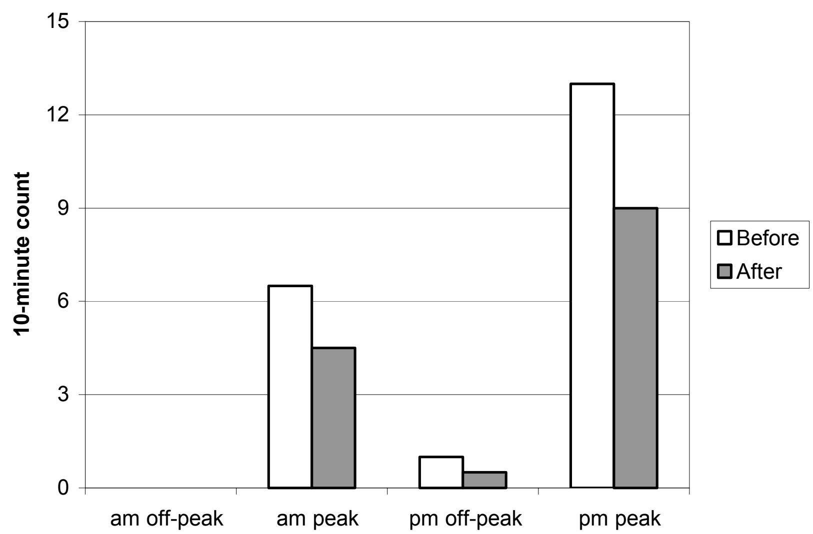



**Table 4: Child Pedestrian and Cyclist Counts, Jasper Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 0.0 | 0.0 | N/A |
| **a.m. peak** | 6.0 | 4.5 | -31% |
| **p.m. off-peak** | 1.0 | 0.5 | -50% |
| **p.m. peak** | 13.0 | 9.0 | -31% |

### *Locations of pedestrians*

Researchers monitored the locations of pedestrians relative to the sidewalk or street during 45-minute morning and afternoon observation periods. Figure 4 plots the number of pedestrians who used either: (1) a sidewalk and/or path separated from the street; or (2) a street and/or street shoulder.

Table 5 shows that the total number of child pedestrians increased 12 percent after installation of the crossing improvement. Few of these children utilized the street shoulder or street. The number of children that used only a sidewalk or path was not appreciably different after construction of the lighting system, decreasing from 51 in the pre-construction period to 50 in the post-construction period. Surprisingly, the number of children observed on a street or street shoulder actually increased from zero students to 7 after the SR2S project was implemented.

**Figure 4: Child Pedestrian Locations, Jasper Elementary School**


**Table 5: Locations of Child Pedestrians, Jasper Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **Sidewalk or path only** | 51 | 50 | -2% |
| **Shoulder or street** | 0 | 7 | N/A |
| ***Total child pedestrians*** | ***51*** | ***57*** | ***12%*** |

### *Yielding behavior*

The final facet of the traffic analysis was to document whether automobile drivers adequately yield to pedestrians and cyclists. This behavior was indicated with a basic yes or no: the former specifies that the driver obeyed traffic laws, and waited, if obligated, for the pedestrian or cyclist to proceed safely across the intersection, and the latter suggests that the driver encroached on the pedestrian's path, thereby forcing the person to yield to the motorized vehicle. Figure 5 shows that 96 percent of the observed motorists (27 of 28) yielded during the before project construction observation period, while 100 percent of the 30 refereed motorists fully yielded to pedestrians and cyclists after construction (Table 6).

**Figure 5: Yielding Behavior, Jasper Elementary School**

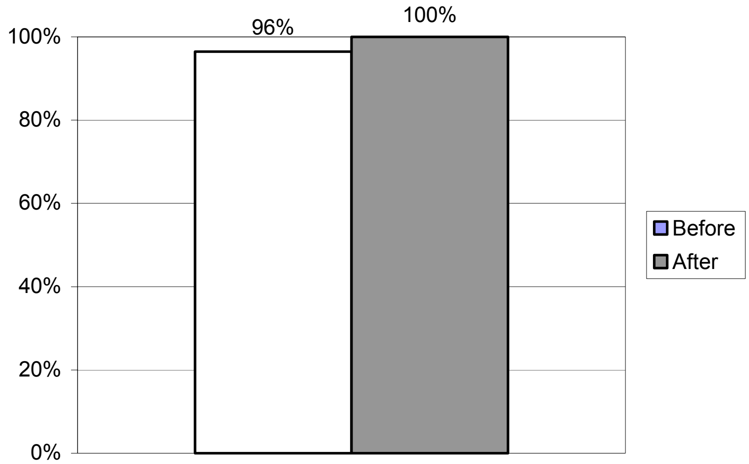



**Table 6: Yielding Behavior, Jasper Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Yielded** | 27 (96%) | 30 (100%) | 27 (96%) |
| **Did not yield** | 1 (4%) | 0 (0%) | 1 (4%) |
| ***Total*** | ***28*** | ***30*** | |

## III. Survey results

The final section of this report focuses on parents' responses to take-home surveys that were distributed before and after project construction. The surveys solicited demographic information such as household size, employment status, and household income, as well as numerous transportation-related responses. Parents were asked to identify the transportation mode their child uses for their journey to and from school, their feelings of the SR2S infrastructure project, and whether or not the construction is likely to change their children's travel behavior. A total of 143 pre-construction (55.60 percent) and 77 post-construction surveys (31.60 percent) were completed by parents of Jasper Elementary School students. A summary of these responses is provided below.

### *Demographic information*

Table 7 summarizes demographic attributes gleaned from the pre- and post-construction survey responses. The investigators wish to emphasize that the before and after values were drawn from two different surveys and two different samples. Therefore, the change in percentage points of these variables should be interpreted more as a measure of variation between the samples rather than a real change in the population's characteristics.

**Table 7: Demographic Characteristics of Households, Jasper Elementary School**

| | Before | After | Change |
|---|---|---|---|
| ***Average age of child for whom survey was completed*** | 9.43 | 9.62 | 0.19 |
| ***Sex of child (% female)*** | 54.55% | 62.34% | 7.79% |
| ***Average grade of child*** | 4.08 | 4.16 | 0.08 |
| ***Percentage of population living with spouse or significant other*** | 79.02% | 85.71% | 6.69% |
| ***Average number of persons in house*** | 4.74 | 4.57 | -0.17 |
| ***Average number of persons between 6 and 16 years of age*** | 2.05 | 2.03 | -0.02 |
| ***Average number of licensed drivers in household*** | 2.23 | 2.19 | -0.04 |
| ***Average number of cars in household*** | 2.35 | 2.47 | 0.12 |
| ***Average number of persons working full- or part-time*** | 2.00 | 1.75 | -0.25 |
| ***Average number of persons working 20 hours per week or more*** | 1.63 | 1.70 | 0.07 |
| ***Average number of years parent in school*** | 14.15 | 14.07 | -0.08 |
| ***Annual Household Income*** | | | |
| **$15,000 or less** | 5 (3.50%) | 2 (2.60%) | -3 (-0.90%) |
| **$15,001 to $35,000** | 15 (10.49%) | 4 (5.19%) | -11 (-5.29%) |
| **$35,001 to $55,000** | 14 (9.79%) | 6 (7.79%) | -8 (-2.00%) |
| **$55,001 to $75,000** | 35 (24.48%) | 25 (32.47%) | -10 (7.99%) |
| **$75,001 or more** | 56 (39.16%) | 33 (42.86%) | -23 (3.70%) |
| **No response** | 18 (12.59%) | 7 (9.09%) | -11 (-3.50%) |
| ***Years living in neighborhood*** | | | |
| **Under 1 year** | 9 (6.29%) | 5 (6.49%) | -4 (0.20%) |
| **1 to 5 years** | 58 (40.56%) | 30 (38.96%) | -28 (-1.60%) |
| **6 to 10 years** | 36 (25.17%) | 24 (31.17%) | -12 (5.99%) |
| **Over 10 years** | 31 (21.68%) | 13 (16.88%) | -18 (-4.80%) |
| **Whole life** | 4 (2.80%) | 3 (3.90%) | -1 (1.10%) |
| **No response** | 5 (3.50%) | 2 (2.60%) | -3 (-0.90%) |
| ***Years living in U.S.*** | | | |
| **Under 1 year** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **1 to 5 years** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **6 to 10 years** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **Over 10 years** | 18 (12.59%) | 5 (6.49%) | -13 (-6.09%) |
| **Whole life** | 120 (83.92%) | 71 (92.21%) | -49 (8.29%) |
| **No response** | 5 (3.50%) | 1 (1.30%) | -4 (-2.20%) |
| ***Born in U.S. (%)*** | 83.22% | 89.61% | 6.39% |

The demographic characteristics suggest that the average age and grade of the child for whom the survey was completed were about 9.43 years and 9.62 respectively.  Approximately 85 percent of the parents reported that they lived with a significant other (i.e. husband/wife or boyfriend/girlfriend) and an average 1.75 persons in each household worked full- or part-time. Parents attended school for an average 14.05 years.  Nearly 50 percent of the respondents have lived in their present neighborhood for over five years and 96.51 percent have lived in the U.S. their entire life.

On average, the students of Jasper Elementary School live in households with fair mobility potentials and modest incomes.  The average number of persons per household is 4.57 and the average household had almost 2.50 cars and 2.19 licensed drivers.  About 14 percent of the households reported an annual income of $35,000 or less.

### *Distance from School*

Before project construction, 58.04 percent of parents responded that they lived less than one mile away from their child's school (see Figure 6 and Table 8). About 23 percent lived more than 1 mile away and 18.88 percent did not know or did not answer the question. After project construction, the percentage of parents who responded that they lived less than one mile away increased 5.60 percent, to 63.64 percent. Accordingly, the percentage of parents responding that they lived more than one mile away increased by about 2 percent, to 25.97 percent. The percentage of respondents who did not know or who did not respond decreased by about 8 percent, to 10.39 percent.

**Figure 6.  Distances From School, Jasper Elementary School**

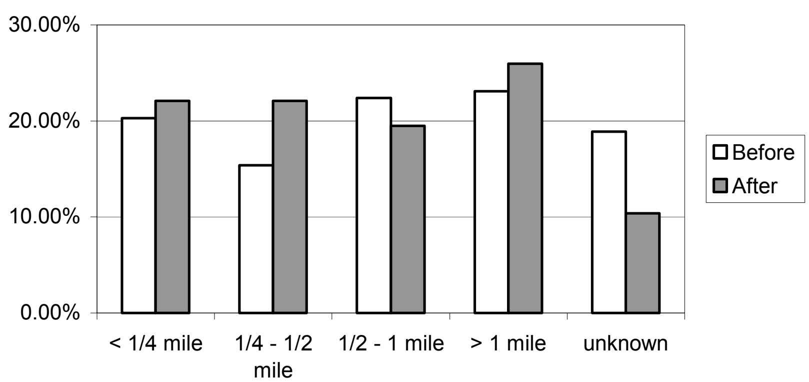



**Table 8. Distances From School, Jasper Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **< 1/4 mile** | 29 (20.28%) | 17 (22.08%) | -12 (1.80%) |
| **1/4 mile–1/2 mile** | 22 (15.38%) | 17 (22.08%) | -5 (6.69%) |
| **1/2 mile–1 mile** | 32 (22.38%) | 15 (19.48%) | -17 (-2.90%) |
| **> 1 mile** | 33 (23.08%) | 20 (25.97%) | -13 (2.90%) |
| **Missing/Other** | 27 (18.88%) | 8 (10.39%) | -19 (-8.49%) |

### *Transportation mode splits*

Figure 7 charts the share of each transportation mode utilized for the children's commutes to school. From the figure, it can be discerned that the private vehicle is the dominant mode of transport. Approximately 60.14 percent of the children represented in the survey were driven to school in a private automobile in the pre-construction period and 68.83 percent in the post-construction period. Bus and transit represent a notable share of pre- and post-construction commutes (18.18 percent and 15.58 percent, respectively) and the combined share of those who walked or bicycled amounted to 18.18 percent in the pre-construction period. Surprisingly, the combined number of those who bicycled or walked actually fell from 26 to 11 (a 3.90 percent decrease) after implementation of the crossing improvement (Table 9).

**Figure 7: Transportation Mode Splits for Commutes to School, Jasper Elementary School**

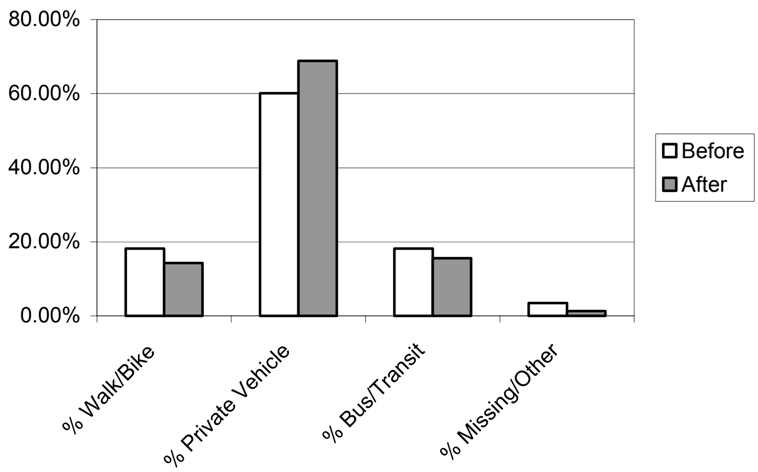



**Table 9: Transportation Mode Splits for Commutes to School, Jasper Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Walk/bike** | 26 (18.18%) | 11 (14.29%) | -15 (-3.90%) |
| **Private vehicle** | 86 (60.14%) | 53 (68.83%) | -33 (8.69%) |
| **Bus/transit** | 26 (18.18%) | 12 (15.58%) | -14 (-2.60%) |
| **Missing/other** | 5 (3.50%) | 1 (1.30%) | -4 (-2.20%) |

### *Transportation mode splits by distance from school*

A cross-tabulation of transportation mode by distance from school suggests that location is associated with the likelihood that a child walks or bicycles to school (Figure 8). More specifically, 6 of the 12 children who walked to Jasper Elementary after the project was constructed lived within a quarter-mile of the school's campus and the share of walkers, when compared to alternative transportation modes, steadily declined with distance from school. The percentage of students that commuted by private vehicle was also lower for families living within a quarter-mile of school (56.25 percent) than children living over a mile from school (71.43 percent). The private vehicle share was 64.71 percent for children living between a quarter-mile and a half-mile from school and 60.00 percent for those living between a half-mile and one mile from school (Table 10).

**Figure 8: Transportation Mode Splits for Commutes to School by Distance from School , Jasper Elementary School**

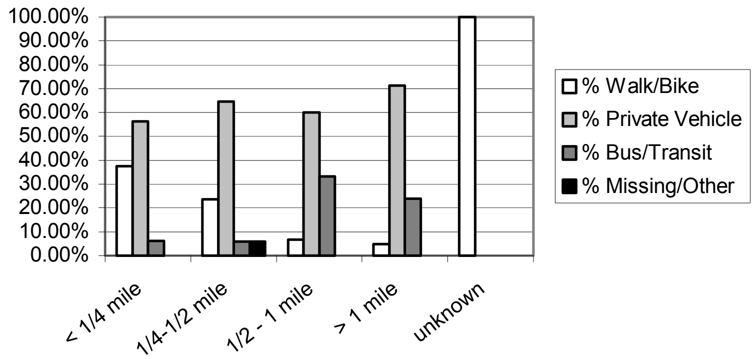



**Table 10: Transportation Mode Splits for Commutes to School by Distance from School , Jasper Elementary School**

| | < 1/4 mile | 1/4-1/2 mile | 1/2 - 1 mile | > 1 mile | unknown |
|---|---|---|---|---|---|
| **Walk/bike** | 6 (37.50%) | 4 (23.53%) | 1 (6.67%) | 1 (4.76%) | 8 (100.00%) |
| **Private vehicle** | 9 (56.25%) | 11 (64.71%) | 9 (60.00%) | 15 (71.43%) | 0 (0.00%) |
| **Bus/transit** | 1 (6.25%) | 1 (5.88%) | 5 (33.33%) | 5 (23.81%) | 0 (0.00%) |
| **Missing/other** | 0 (0.00%) | 1 (5.88%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |

### *Location of SR2S construction project relative to survey respondents*

Survey results reveal that few students walk more as a result of the implementation of the SR2S project. In fact, only one student whose usual route to school coincided with the SR2S project walked to school more often than before the crosswalk improvement, while three of these children (6.98 percent) actually walked less. None of the 23 children whose usual route did not coincide with the sidewalk construction walked more, while 4 (12.90 percent) walked less (Figure 9 and Table 11).

**Figure 9: Project Along Usual Route vs. Percentage Walked, Jasper Elementary School**

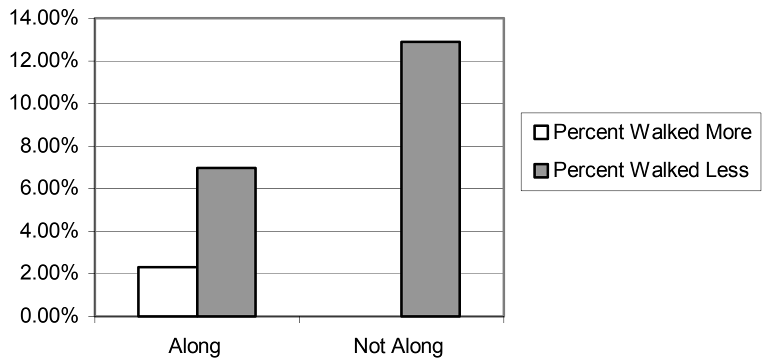



**Table 11: Project Along Usual Route vs. Percentage Walked, Jasper Elementary School**

| | Along Route | Not Along Route |
|---|---|---|
| **Percent walked more** | 1 (2.33%) | 0 (0.00%) |
| **Percent walked less** | 3 (6.98%) | 4 (12.90%) |

### *Parents' perceptions of effects of SR2S construction project*

The Jasper after-construction survey also collected information concerning the parents' perceptions of the project's effects. Many parents felt that the project produced favorable results such as easing street crossings (66.23 percent), separating children from cars (48.05 percent), and making motorists more aware of children along the road (62.34 percent). While parents were undecided whether the project slows traffic (45.45 percent said yes and 44.16 percent said no), in general, 63.64 percent of the respondents feel the project enhances safety for child pedestrians and bicyclists (Figure 10 and Table 12).

**Figure 10: Perceived Effects of Project, Jasper Elementary School**

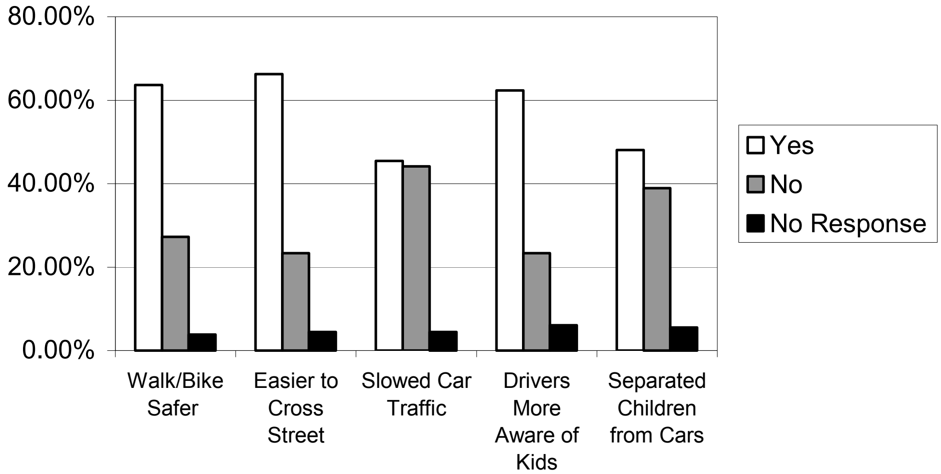



**Table 12: Perceived Effects of Project, Jasper Elementary School**

| | Yes | No | No Response |
|---|---|---|---|
| **Walk/bike safer** | 49 (63.64%) | 21 (27.27%) | 7 (3.87%) |
| **Easier to cross street** | 51 (66.23%) | 18 (23.38%) | 8 (4.42%) |
| **Slows car traffic** | 35 (45.45%) | 34 (44.16%) | 8 (4.42%) |
| **Drivers more aware of children** | 48 (62.34%) | 18 (23.38%) | 11 (6.08%) |
| **Separates children from cars** | 37 (48.05%) | 30 (38.96%) | 10 (5.52%) |

### *Parents' perceptions of importance of SR2S construction project*

The final part of this section briefly outlines the parents' perceptions of the importance of the SR2S project. Figure 11 shows that 23.38 percent of the respondents feel the project is the single most important construction project that could have been built while 44.16 percent believe that it was among the few most important construction projects that could have been built. Only 2 of the 67 parents that responded to this question (2.60 percent) felt that the project was not at all important (Table 13).

**Figure 11: Perceived Importance of Project, Jasper Elementary School**

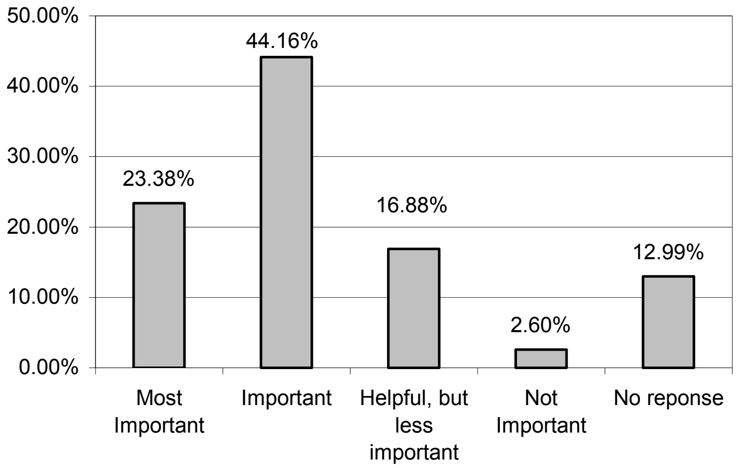



**Table 13: Perceived Importance of Project, Jasper Elementary School**

| | |
|---|---|
| **Most Important** | 18 (23.38%) |
| **Important** | 34 (44.16%) |
| **Helpful, but less important** | 13 (16.88%) |
| **Not Important** | 2 (2.60%) |
| **No response** | 10 (12.99%) |

## Juan Cabrillo Elementary School

### I. School location and project description

30237 Morning View Drive
Malibu, CA 90265
Contact: Pat Cairns, Principal
Phone: (310) 457-0360
Fax: (310) 457-0367

Grades: K-5
School Population: 329
Average class size: 22.2
<u>Ethnic Makeup:</u>
Asian: 2.1%
Hispanic: 17.0%
African American: 0.6%
White: 79.6%
City population (Malibu): 12,575
U.S. Census Classification:

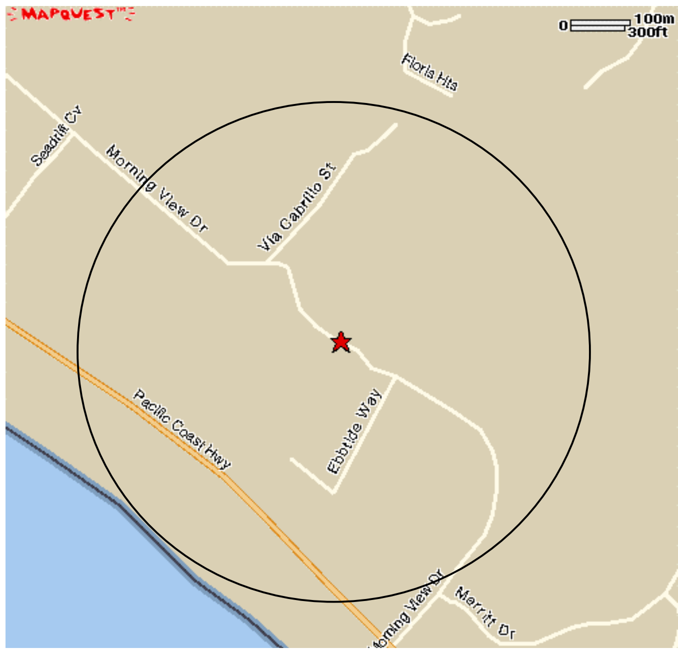
**Date observed:** 11/04/02 and 11/06/02 (before construction); 05/14/03 & 05/16/03 (after construction)

**Project type:** Sidewalk improvements

### *Description of neighborhood*

This neighborhood is located in Malibu.  The area is mainly residential with large lots and low density housing, giving the neighborhood an almost rural quality.  Coastal access is also a couple of blocks away.

The project designed and constructed a pathway of decomposed granite, bordered by a 8” x 8” wood curb, with appropriate signage, along Morning View Drive, from Seastar Drive to Via Cabrillo.




Star indicates location of elementary school; Circle represents portion of neighborhood included in the study (approx. ¼ mile radius from the elementary school)

Juan Cabrillo Elementary School

New decomposed granite pathway near school

Decomposed granite pathway southeast from school along Morning View Drive

Northwest view of Morning View Drive from Juan Cabrillo Elementary School

### *Neighborhood Characteristics*

Based on before-construction observations of the quarter-mile area surrounding Juan Cabrillo Elementary School, this neighborhood has the following urban design characteristics, which are potentially related to pedestrian activity and traffic safety in the area.

**Table 1: Urban Design Characteristics, Juan Cabrillo Elementary School**

| Urban Design Elements Associated with Perceptions of Traffic Safety | |
|---|---|
| **Blocks with a complete sidewalk** | 17% |
| **Blocks with a complete buffered, sidewalk** | 100% |
| **Blocks with bike lanes** | 67% |
| **Blocks with bike lanes separated from the street** | 100% |
| **Urban Design Elements Associated with Perceived Crime Safety** | |
| **Blocks with first floor windows visible from the street** | 100% |
| **Blocks with street lighting** | 100% |
| **Blocks where abandoned buildings were absent** | 100% |
| **Blocks where rundown buildings were absent** | 100% |
| **Blocks where vacant lots were absent** | 67% |
| **Blocks where graffiti was absent** | 67% |
| **Blocks where undesirable land uses were absent** | 100% |
| **Urban Design Elements Associated with Traffic Volume, Flow and Speed** | |
| **Average number of traffic lanes within a block** | 2 |
| **Average street width of a block (in ft.)** | 34 |
| **Average block length of a block (in ft.)** | 1544 |
| **Average sidewalk width of a block (in ft.)** | 4 |
| **Blocks with traffic circles** | 100% |
| **Blocks with bulbouts** | 100% |
| **Blocks with speed bumps** | 100% |
| **Blocks with cul-de-sacs** | 17% |
| **Blocks with medians** | 100% |
| **Blocks with paving treatments** | 100% |
| **Urban Design Elements Associated with Walkability** | |
| **Blocks with street trees** | 17% |
| **Blocks with mixed uses** | 51% |
| **Blocks with public space** | 14% |
| **Blocks with street furniture** | 6% |

## II. Traffic analysis

Juan Cabrillo Elementary is located on Morning View Drive between Via Cabrillo Street and Ebbtide Way. Pre-construction vehicle and pedestrian data were gathered in front of the school on Morning View Drive. Pre-construction data were gathered on November 4 and November 6, 2002. Post-construction data were collected on May 14 2003 and May 16, 2003. Morning and afternoon observation periods (45-minute each) commenced at 7:45am and 2:25pm, respectively, and coincide with the peak flows of school traffic.

### *Vehicle counts*

Figure 1 plots the combined volume of east- and west-bound traffic along Morning View Drive for the morning and afternoon, pre- and post-construction periods. *Off-peak* values represent the total number of vehicles observed over the last ten minutes of the morning period or the first ten minutes of the afternoon period. These periods typically coincide most closely with traffic patterns outside of school drop off and pick up times. *Peak* values represent the sum of vehicles counted over the ten-minute period with the greatest traffic volume.

In the *before* construction period, the off-peak value for morning drop offs was 14.5 cars in the 10 minute period. This value increased slightly after the construction of the SR2S project, to 16.0. Likewise, the peak value for morning drop offs was 105.5 cars before construction, which increased to 132.5 after construction of the project. The same can be said for afternoon off-peak and peak values: off-peaks values increased from 16.5 to 22.5, and peak values increased from 89.0 to 112.0 before and after construction, respectively.

These distributions suggest that a.m. peak traffic volumes were greater than p.m. peak levels, both before and after construction of the SR2S project. Vehicle counts increased after the construction of the SR2S project for all four time periods measured, with the greatest change taking place during the p.m. off-peak (36 percent). Changes in vehicle counts were identical for the morning peak period and the afternoon peak period: 26 percent (Table 2).

**Figure 1: Vehicle Counts, Juan Cabrillo Elementary School**

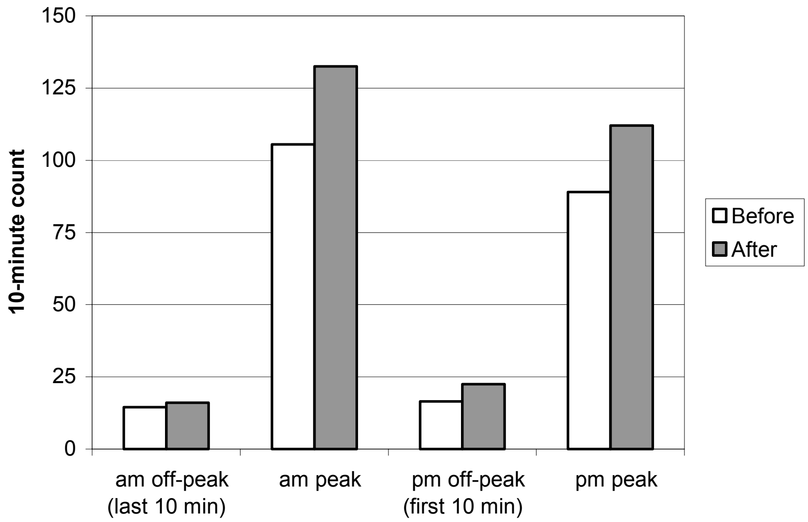



**Table 2: Vehicle Counts, Juan Cabrillo Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 14.5 | 16.0 | 10% |
| **a.m. peak** | 105.5 | 132.5 | 26% |
| **p.m. off-peak** | 16.5 | 22.5 | 36% |
| **p.m. peak** | 89.0 | 112.0 | 26% |

### *Vehicle speeds*

Like vehicle counts, average vehicle speeds are reported with respect to off-peak values, that is, the average speeds observed over the last ten minutes of the morning period and the first ten minutes of the afternoon period. Off-peak vehicle speeds more closely reflect average velocities for non-drop off and pick-up hours. *Peak* velocities—the lowest ten-minute mean speeds averaged over the two-day observation period—are also provided for the morning and afternoon, pre- and post-construction periods. The error bars in Figure 2 are based on an assumed human accuracy of +/- 0.3 seconds in the measurement of travel time used to calculate vehicle speed. The researchers believe this is, if anything, an overestimate of the level of human inaccuracy involved in the speed measurements.

Off-peak speeds on Morning View Drive in the morning observation period marginally increased from 23.66 mph in the pre-construction period to 23.95 mph after construction (change of 1 percent). The peak a.m. average velocities before and after project construction decreased slightly from 22.90 mph to 22.20 mph (a decrease of -3 percent). Afternoon off-peak speeds decreased from 23.17 mph before construction to 22.02 mph (a decrease of 5 percent) after project construction. The peak p.m. velocities followed a trend similar to the a.m. peak velocities, decreasing 1 percent from 19.84 mph pre-construction to a post-construction average speed of 19.74 mph (Table 3).

**Figure 2: Average Vehicle Speeds, Juan Cabrillo Elementary School**

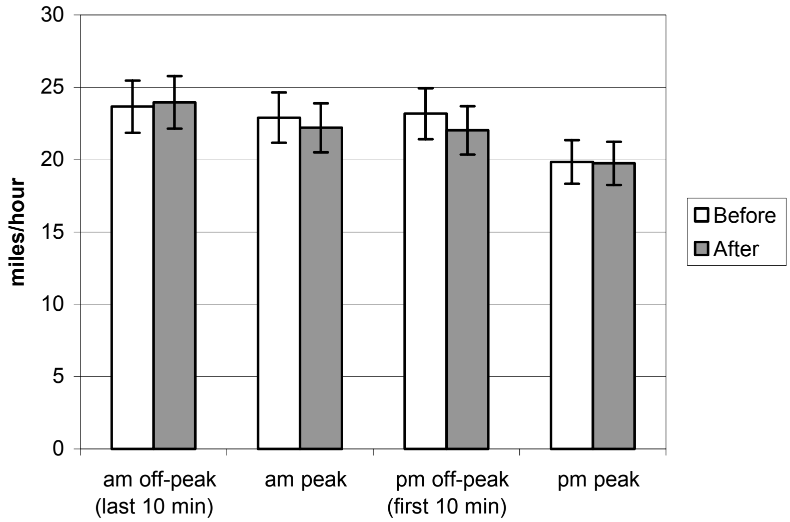



**Table 3: Average Vehicle Speeds, Juan Cabrillo Elementary School**

| | Before (mph) | After (mph) | % Change |
|---|---|---|---|
| **a.m. off-peak** | 23.66 | 23.95 | 1% |
| **a.m. peak** | 22.90 | 22.20 | -3% |
| **p.m. off-peak** | 23.17 | 22.02 | -5% |
| **p.m. peak** | 19.84 | 19.74 | -1% |

### *Pedestrian and cyclist counts*

*Off-peak* and *peak* count measures are reported for combined pedestrian and cyclist traffic. Figure 3 plots these values for Juan Cabrillo Elementary School. The off-peak count increased from 0.5 (pre-construction) to 1 (post-construction) in the morning period and increased from 4 (pre-construction) to 7 (post-construction) in the afternoon period. The post-construction, peak values were higher in both the morning (31.5) and afternoon (59.5) periods compared to the pre-construction values of 27 and 35 respectively.

Off-peak counts for pedestrians and cyclists were moderately low overall, with most activity clustered in the afternoon. Following the construction of the SR2S project, it appears as though the percentage of pedestrian activity has increased, with the most changes occurring in the afternoon (75 percent and 70 percent for p.m. off-peak and p.m. peak, respectively) (Table 4).

**Figure 3: Child Pedestrian and Cyclist Counts, Juan Cabrillo Elementary School**

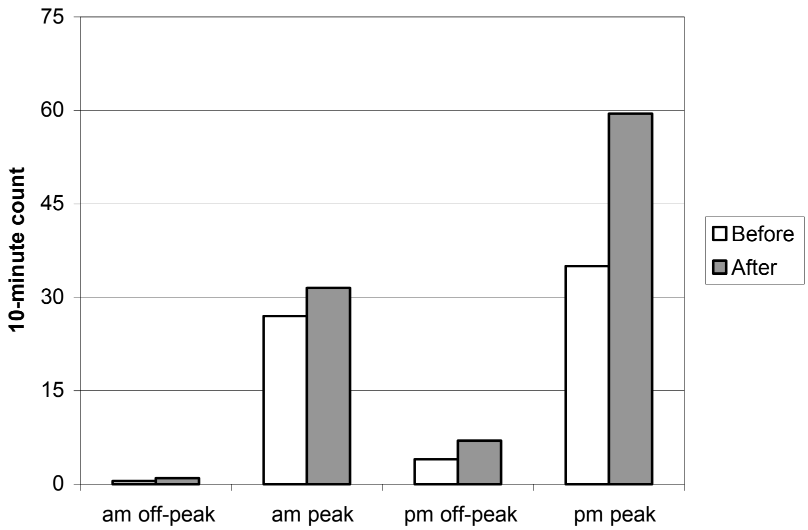



**Table 4: Child Pedestrian and Cyclist Counts, Juan Cabrillo Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 0.5 | 1 | 100% |
| **a.m. peak** | 27 | 31.5 | 17% |
| **p.m. off-peak** | 4 | 7 | 75% |
| **p.m. peak** | 35 | 59.5 | 70% |

### *Location of pedestrians*

Researchers monitored the locations of pedestrians relative to the sidewalk or street during 45-minute morning and afternoon observation periods. Figure 4 plots the number of pedestrians who used either: (1) a sidewalk and/or path separated from the street; or (2) a street and/or street shoulder.

Figure 4 and Table 5 show that, before project construction, 256 of 274 child pedestrians and cyclists utilized the sidewalk and/or path to get to and from school, whereas only 18 of 274 used the shoulder or street. After construction, the number of child pedestrians and cyclists who used a sidewalk or path increased by 16 percent, to 256 of 296. Accordingly, the number of children using the shoulder or street decreased from 18 to 6 of 302.

**Figure 4: Child Pedestrian Locations, Juan Cabrillo Elementary School**

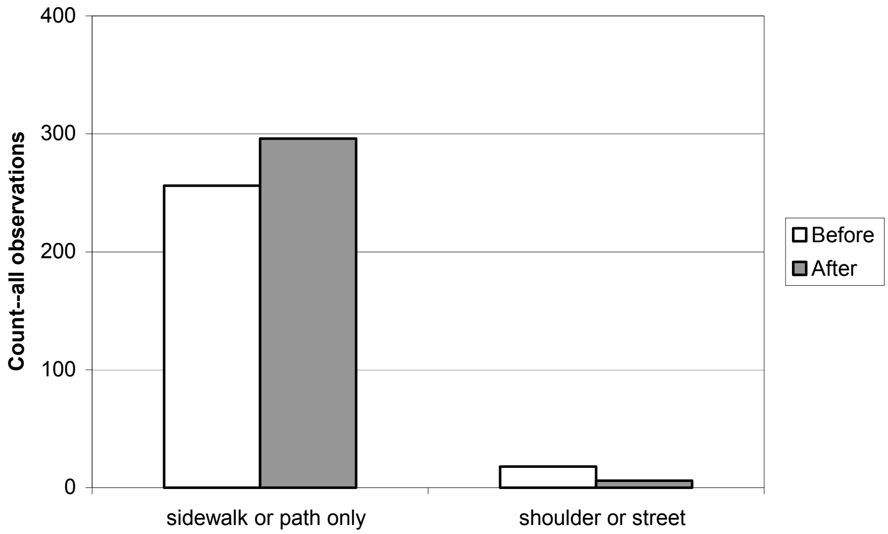



**Table 5: Child Pedestrian Locations, Juan Cabrillo Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **Sidewalk or path only** | 256 | 296 | 16% |
| **Shoulder or street** | 18 | 6 | |
| ***Total child pedestrians*** | ***274*** | ***302*** | ***10%*** |

### *Yielding behavior*

The final facet of the traffic analysis was to document whether automobile drivers adequately yield to pedestrians and cyclists. This behavior was indicated with a basic yes or no: the former specifies that the driver obeyed traffic laws, and waited, if obligated, for the pedestrian or cyclist to proceed safely across the intersection, and the latter suggests that the driver encroached on the pedestrian's path, thereby forcing the person to yield to the motorized vehicle. Figure 5 shows that 100 percent of the observed drivers (59 of 59) yielded during the before project construction observation period. After construction, the percentage remained the same: 100 percent of observed drivers yielded to pedestrians and cyclists (129 of 129) (Table 6).

**Figure 5: Yielding Behavior, Juan Cabrillo Elementary School**

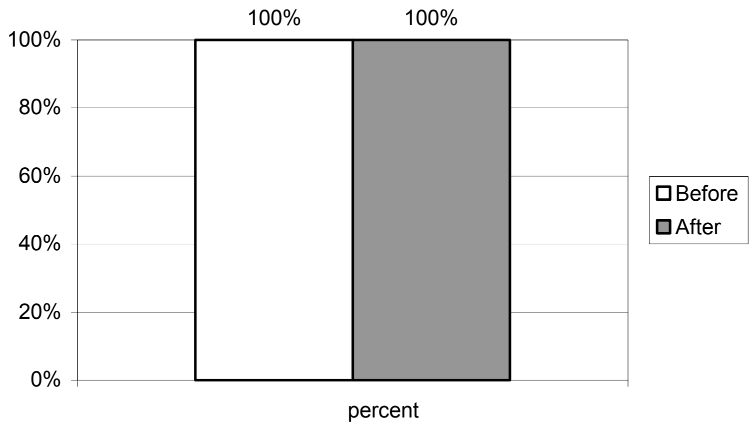



**Table 6: Yielding Behavior, Juan Cabrillo Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Yielded** | 59 (100%) | 129 (100%) | |
| **Did not yield** | 0 (0.00%) | 0 (0.00%) | |
| *Total* | *59* | *129* | |

## III. Survey results

This section of the analysis examines parents' responses to take-home surveys that were distributed before and after project construction. The surveys solicited demographic information such as household size, employment status, and household income, as well as numerous transportation-related responses. Parents were asked to identify the transportation mode their child uses for their journey to and from school, parents' assessment of the SR2S construction project, and whether or not the construction project was likely to change their children's travel behavior. A total of 58 pre-construction (34.73 percent) and 38 post-construction (23.03 percent) surveys were completed by parents of Juan Cabrillo Elementary School students. A summary of these responses is provided below.

### *Demographic information*

Table 7 describes the households that completed the survey. The researchers wish to emphasize that the before and after values were drawn from two different surveys and two different samples. Therefore, the percentage change of these variables should be interpreted more as a measure of variation between the samples rather than a real change in the population's characteristics.

**Table 7: Demographic Characteristics of Households, Juan Cabrillo Elementary School**

| | Before | After | Change |
|---|---|---|---|
| ***Average age of child for whom survey was completed*** | 9.29 | 9.76 | 0.47 |
| ***Sex of child (% female)*** | 36.21% | 50.00% | 13.79% |
| ***Average grade of child*** | 4.25 | 4.16 | -0.09 |
| ***Percentage of population living with spouse or significant other*** | 84.48% | 81.58% | -2.90% |
| ***Average number of persons in house*** | 4.16 | 4.27 | 0.11 |
| ***Average number of persons between 6 and 16 years of age*** | 2.41 | 2.24 | -0.17 |
| ***Average number of licensed drivers in household*** | 1.98 | 2.00 | 0.02 |
| ***Average number of cars in household*** | 2.16 | 2.36 | 0.20 |
| ***Average number of persons working full- or part-time*** | 1.58 | 1.55 | -0.03 |
| ***Average number of persons working 20 hours per week or more*** | 1.57 | 1.48 | -0.09 |
| ***Average number of years parent in school*** | 15.09 | 16.06 | 0.97 |
| ***Annual Household Income*** | | | |
| **$15,000 or less** | 2 (3.45%) | 2 (5.26%) | 0 (1.81%) |
| **$15,001 to $35,000** | 4 (6.90%) | 4 (10.53%) | 0 (3.63%) |
| **$35,001 to $55,000** | 3 (5.17%) | 1 (2.63%) | -2 (-2.54%) |
| **$55,001 to $75,000** | 4 (6.90%) | 3 (7.89%) | -1 (1.00%) |
| **$75,001 or more** | 37 (63.79%) | 22 (57.89%) | -15 (-5.90%) |
| **No response** | 8 (13.79%) | 6 (15.79%) | -2 (2.00%) |
| ***Years living in neighborhood*** | | | |
| **Under 1 year** | 5 (8.62%) | 3 (7.89%) | -2 (-0.73%) |
| **1 to 5 years** | 17 (29.31%) | 9 (23.68%) | -8 (-5.63%) |
| **6 to 10 years** | 17 (29.31%) | 13 (34.21%) | -4 (4.90%) |
| **Over 10 years** | 16 (27.59%) | 10 (26.32%) | -6 (-1.27%) |
| **Whole life** | 1 (1.72%) | 2 (5.26%) | 1 (3.54%) |
| **No response** | 2 (3.45%) | 1 (2.63%) | -1 (-0.82%) |
| ***Years living in U.S.*** | | | |
| **Under 1 year** | 1 (1.72%) | 1 (2.63%) | 0 (0.91%) |
| **1 to 5 years** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **6 to 10 years** | 0 (0.00%) | 2 (5.26%) | 2 (5.26%) |
| **Over 10 years** | 10 (17.24%) | 8 (21.05%) | -2 (3.81%) |
| **Whole life** | 46 (79.31%) | 27 (71.05%) | -19 (-8.26%) |
| **No response** | 1 (1.72%) | 0 (0.00%) | -1 (-1.72%) |
| ***Born in U.S. (%)*** | 79.31% | 71.05% | -8.26% |

Overall, the students of Juan Cabrillo Elementary School come from medium-sized households (average of four persons per household) and adequate mobility potentials such that each household has an average 2.4 cars and 2 licensed drivers. Over 80 percent of households have spouses or significant others living together with children that are, on average, in the second grade. Approximately 10 percent of households in the *before* survey and 15 percent of households in the *after* survey earn a modest income of $35,000 per annum or less, whereas almost 64 percent of households and 58 percent of households from the *before* and *after* surveys, respectively, earn more than $75,000. Although over 70 percent of the respondents were born in the US and have lived in the U.S. their whole life, only about one-third has lived in their present neighborhood for over 10 years.

### *Distance from school*

Before project construction, 20.69 percent of parents responded that they lived less than one mile away from their child's school (see Figure 6 and Table 8). About 74 percent lived more than 1 mile away and 5.17 percent did not know or did not answer the question. After project construction, the percentage of parents who responded that they lived less than one mile away increased to 5.63 percent, to 26.32 percent. Accordingly, the percentage of parents responding that they lived more than one mile away decreased by almost 14 percent, to 60.53 percent. The percentage of respondents who did not know or who did not respond increased by about 8 percent, to 13.16 percent.

**Figure 6: Distance From School, Juan Cabrillo Elementary School**

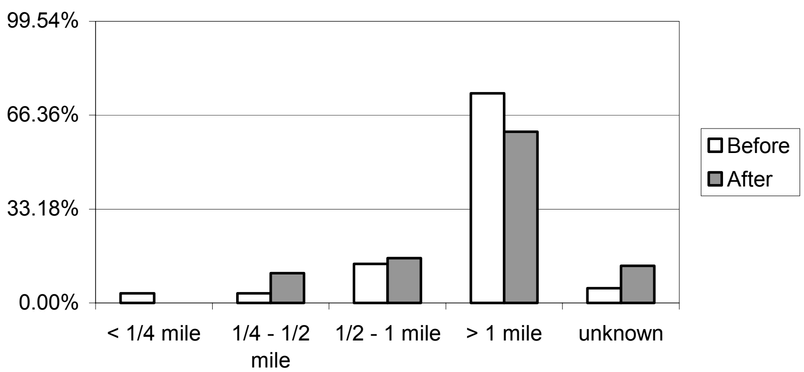



**Table 8: Distance from school, Juan Cabrillo Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **< 1/4 mile** | 2 (3.45%) | 0 (0.00%) | -2 (-3.45%) |
| **1/4 - 1/2 mile** | 2 (3.45%) | 4 (10.53%) | 2 (7.08%) |
| **1/2 - 1 mile** | 8 (13.79%) | 6 (15.79%) | -2 (2.00%) |
| **> 1 mile** | 43 (74.14%) | 23 (60.53%) | -20 (-13.61%) |
| **Unknown** | 3 (5.17%) | 5 (13.16%) | 2 (7.99%) |

### *Transportation mode splits*

In terms of mode split, 91.38 percent of students were driven to school in a private vehicle whereas only 5.17 percent walked or bicycled to school before project construction. No students used public transit and 3.45 percent of students used other modes of transportation or who had missing responses (Figure 7 and Table 9). Once construction had been completed, the share of students driven to and from school decreased marginally (91.38 percent vs. 89.47 percent before and after, respectively) while the amount of students walking and biking increased (5.17 percent vs. 7.89 percent before and after, respectively). The percentage of children taking public transportation increased by 2.63 percent whereas the percentage of students using other modes of transportation or who had missing responses dropped to zero.

**Figure 7: Transportation Mode Splits for Commutes to School, Juan Cabrillo Elementary School**

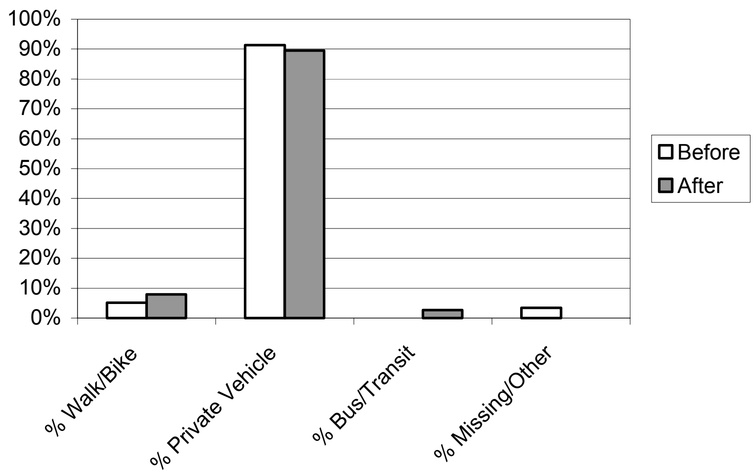



**Table 9: Transportation Mode Splits for Commutes to School, Juan Cabrillo Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Walk/Bike** | 3 (5.17%) | 3 (7.89%) | 0 (2.72%) |
| **Private Vehicle** | 53 (91.38%) | 34 (89.47%) | -19 (-1.91%) |
| **Bus/Transit** | 0 (0.00%) | 1 (2.63%) | 1 (2.63%) |
| **Missing/Other** | 2 (3.45%) | 0 (0.00%) | -2 (-3.45%) |

### *Transportation mode splits by distance from school*

Most families lived more than one mile away from school, with 95.65 percent using a private vehicle to take their child to school. When the distance to school was between a half-mile and a mile, private vehicles were also used most often: about 83 percent of families used private vehicles to take their child to school whereas only 16.67 percent of children walked or biked at this distance from school. When families lived a quarter mile to a half-mile away from the school, 50 percent of children were driven by private vehicle and 50 percent walked or biked.

The responses to this question imply that distance to school (particularly beyond a half mile) and the mode of transportation used to get to school are associated with the likelihood that a child walks or bicycles to school (Figure 8 and Table 10).

**Figure 8: Transportation Mode Splits for Commutes to School by Distance from School, Juan Cabrillo Elementary School**

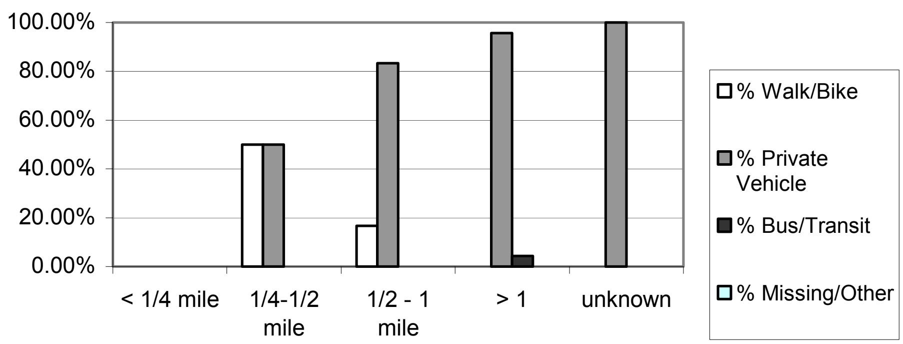



**Table 10: Transportation Mode Splits for Commutes to School by Distance from School, Juan Cabrillo Elementary School**

| | **< 1/4 mile** | **1/4-1/2 mile** | **½ - 1 mile** | **> 1** | **unknown** |
|---|---|---|---|---|---|
| *Walk/Bike* | 0 (0.00%) | 2 (50.00%) | 1 (16.67%) | 0 (0.00%) | 0 (0.00%) |
| **Private Vehicle** | 0 (0.00%) | 2 (50.00%) | 5 (83.33%) | 22 (95.65%) | 5 (100.00%) |
| **Bus/Transit** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 1 (4.35%) | 0 (0.00%) |
| **Missing/Other** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |

### *Location of SR2S construction project relative to survey respondents*

Among survey respondents, 1 parent said their child walked to school more often after the SR2S project completion, while 5 parents said their child walked to school less often after SR2S project completion. Breaking these changes down depending on whether or not the SR2S project was along the child's usual route to school reveals differences. In cases where the parents said the project was along the usual route to school, 1 child was reported as walking more and 2 walked less compared with pre-construction. In cases where the parents said the project was not along the child's usual route to school, 0 children were reported as walking more and 3 were reported as walking less. Note that these are reports based on the parental surveys, not observations of children. Also note that the survey did not ask parents, in this question, to assess whether the SR2S project caused their child to walk more or less; the survey simply asked whether the child walked to/from school more or less compared to a year ago.

**Figure 9: Project Along Usual Route vs. Percentage Walked, Juan Cabrillo Elementary School**

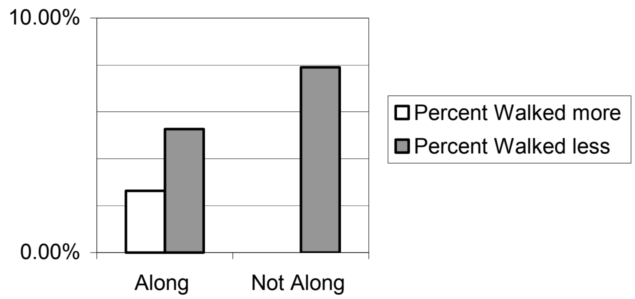



**Table 11: Project Along Usual Route vs. Percentage Walked, Juan Cabrillo Elementary School**

| | Along Route | Not Along Route |
|---|---|---|
| *Percent walked more* | 1 (2.63%) | 0 (0.00%) |
| **Percent walked less** | 2 (5.26%) | 3 (7.89%) |

### *Parents' perceptions of effects of SR2S construction project*

Responses to this question suggest that parents have a generally positive opinion about the project. Specifically, 81.58 percent of parents noticed the project. A majority of parents feel that the project produced favorable results such easing street crossings (73.68 percent), separating children from cars (81.58 percent), making motorists more aware of children along the road (71.05 percent) and, in general, making the student's walk or bicycle ride to school safer (86.84) (Figure 10 and Table 12). However, only 31.58 percent of parents believed that the construction project slowed car traffic near the school, and only 44.74 percent of respondents believed the project was along their child's route to school.

These generally positive perceptions are substantiated by a 12.79 percent increase in the number of children who would not cross an intersection without a painted crosswalk on the road and about a nine percent increase in the number of children who would not walk in roads without a sidewalk.

**Figure 10: Perceived Effects of Project, Juan Cabrillo Elementary School**

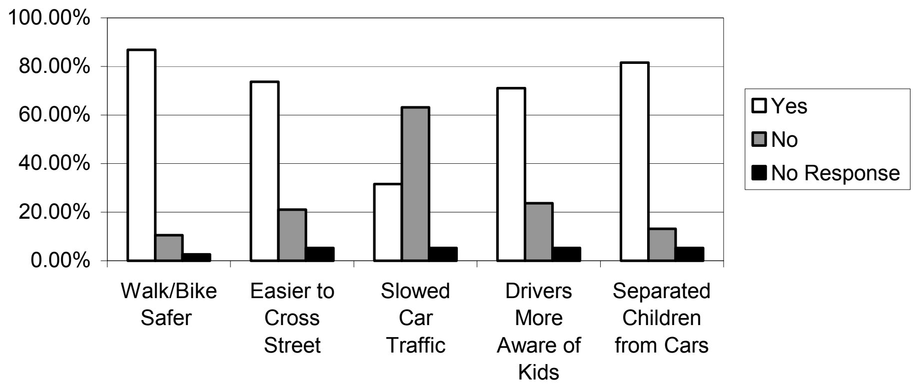



**Table 12: Perceived Effects of Project, Juan Cabrillo Elementary School**

| | *Yes* | **No** | **No Response** |
|---|---|---|---|
| **Walk/bike safer** | 33 (86.84%) | 4 (10.53%) | 1 (2.63%) |
| **Easier to cross street** | 28 (73.68%) | 8 (21.05%) | 2 (5.26%) |
| **Slows car traffic** | 12 (31.58%) | 24 (63.16%) | 2 (5.26%) |
| **Drivers more aware of children** | 27 (71.05%) | 9 (23.68%) | 2 (5.26%) |
| **Separates children from cars** | 31 (81.58%) | 5 (13.16%) | 2 (5.26%) |

### *Parents' perceptions of importance of SR2S construction project*

Almost two-thirds of the respondents (19 of 38) believe that the project is important or the most important project to be built (Figure 11 and Table 13). Of this two-thirds, 50 percent believe the project to be important. In contrast, 23.69 percent believe that the project was less important or not important.  Only five of the 138 respondents did not give a response.

**Figure 11: Perceived Importance of Project, Juan Cabrillo Elementary School**

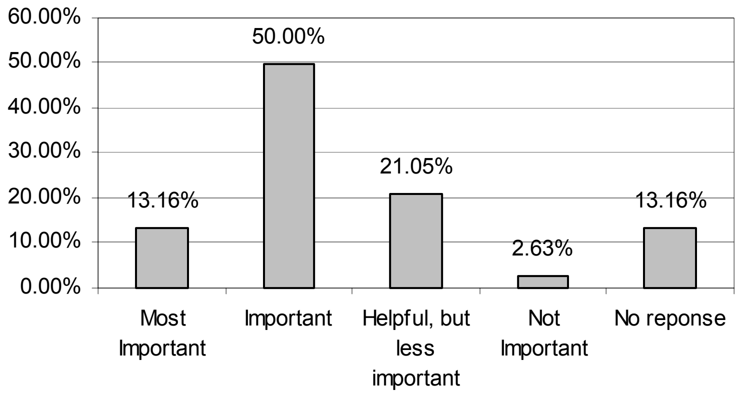



**Table 13: Perceived Importance of Project, Juan Cabrillo Elementary School**

| | |
|---|---|
| **Most Important** | 5 (13.16%) |
| **Important** | 19 (50.00%) |
| **Helpful, but less important** | 8 (21.05%) |
| **Not Important** | 1 (2.63%) |
| **No response** | 5 (13.16%) |

# Mt. Vernon Elementary School

## I. School location and project description

1271 West 10th Street
San Bernardino, CA 92411
Contact: Kristin Kolling, Principal
Phone: (909) 388-6400
Fax: (909) 889-9797

Grades: K-5
School Population: 741
Average class size: 21.3
Ethnic Makeup:
Asian: 0.5%
Hispanic: 84.9%
African American: 9.3%
White: 3.6%
City population (San Bernardino): 190, 200
U.S. Census Classification: “Mid sized city”

**Date observed:** 09/30/02 and 10/02/02 (before construction); 07/15/03 and 07/17/03 (after construction)

**Project type:** Pedestrian crossing improvements

### *Description of neighborhood*

This neighborhood is located in San Bernardino. Although the neighborhood is mainly residential, there are commercial uses along a main arterial. Most of the neighborhood follows a grid-like street pattern. The northern section of the neighborhood has a different urban form and land-use pattern than the rest of the neighborhood, with longer streets, more cul-de-sacs, vacant lots and abandoned and run-down buildings. There is a mix of uses throughout the entire neighborhood, including churches, small food stores, small businesses and parks.

The project took place at the intersection of Mt. Vernon Avenue and 9th Street as well as 9th Street and "L" Street. There were traffic lights at these crossings; however, there were no pedestrian activated signals. The project included a pedestrian activated signal with a countdown mechanism that allowed pedestrians to know how much time they had left in the intersection before the light changed. As a result, pedestrians could step into the street on a green light, but face a red light before they reach the other side. In addition, the intersection of 9th Street and "L" Street lacked pedestrian access ramps. The project installed the signals and construct the ramps at a proposed cost of $142,000.


Star indicates location of elementary schoo
portion of neighborhood included in the stu
radius from the elementary school)

Mt. Vernon Elementary School

Mt. Vernon Street and 9th Street before pedestrian crossing improvement


Pedestrian signal activation device installed at the intersections of Mt. Vernon and 9th Street, and 9th Street and L Street

Mt. Vernon Street and 9th Street after pedestrian crossing improvement

### *Neighborhood Characteristics*

Based on before-construction observations of the quarter-mile area surrounding Mt. Vernon Elementary School, this neighborhood has the following urban design characteristics, which are potentially related to pedestrian activity and traffic safety in the area.

**Table 1: Urban Design Characteristics, Mt. Vernon Elementary School**

| | |
|---|---|
| **Urban Design Elements Associated with Perceptions of Traffic Safety** | |
| **Blocks with a complete sidewalk** | 63% |
| **Blocks with a complete buffered, sidewalk** | 72% |
| **Blocks with bike lanes** | 0% |
| **Blocks with bike lanes separated from the street** | 0% |
| **Urban Design Elements Associated with Perceived Crime Safety** | |
| **Blocks with first floor windows visible from the street** | 82% |
| **Blocks with street lighting** | 90% |
| **Blocks where abandoned buildings were absent** | 83% |
| **Blocks where rundown buildings were absent** | 82% |
| **Blocks where vacant lots were absent** | 48% |
| **Blocks where graffiti was absent** | 14% |
| **Blocks where undesirable land uses were absent** | 97% |
| **Urban Design Elements Associated with Traffic Volume, Flow and Speed** | |
| **Average number of traffic lanes within a block** | 3 |
| **Average street width of a block (in ft.)** | 44 |
| **Average block length of a block (in ft.)** | 547 |
| **Average sidewalk width of a block (in ft.)** | 5 |
| **Blocks with traffic circles** | 0% |
| **Blocks with bulbouts** | 0% |
| **Blocks with speed bumps** | 0% |
| **Blocks with cul-de-sacs** | 7% |
| **Blocks with medians** | 0% |
| **Blocks with paving treatments** | 0% |
| **Urban Design Elements Associated with Walkability** | |
| **Blocks with street trees** | 56% |
| **Blocks with mixed uses** | 51% |
| **Blocks with public space** | 14% |
| **Blocks with street furniture** | 6% |

## II. Traffic analysis

Mount Vernon Elementary is located on Mount Vernon Avenue between 9th and 10th street. Pre-construction vehicle and pedestrian data were gathered at the intersection of Mount Vernon Avenue and 9th Street. Pre-construction data were gathered on September 30 and October 2, 2002. Post-construction data were collected on July 15 and July 17, 2003. Morning and afternoon observation periods (45-minute each) commenced at 8:30am and 3:15pm, respectively, and coincide with the peak flows of school traffic.

### *Vehicle counts*

Figure 1 plots the combined volume of east- and west-bound traffic along Mount Vernon Avenue for the morning and afternoon, pre- and post-construction periods. *Off-peak* values represent the total number of vehicles observed over the last ten minutes of the morning period or the first ten minutes of the afternoon period. These periods typically coincide most closely with traffic patterns outside of school drop off and pick up times. *Peak* values represent the sum of vehicles counted over the ten-minute period with the greatest traffic volume.

In the *before* construction period, the off-peak value for morning drop offs was 178 cars in the 10 minute period. This value decreased after the construction of the SR2S project, to 149. Likewise, the peak value for morning drop offs was 238 cars before construction, which dropped to 176 after construction of the project. The same can be said for afternoon off-peak and peak values: off-peaks values decreased from 281 to 215, and peak values decreased from 357 to 278 before and after construction, respectively.

These distributions suggest that p.m. peak traffic volumes were greater than a.m. peak levels, both before and after construction of the SR2S project. Vehicle counts dropped after the construction of the SR2S project for all four time periods measured, with the greatest change taking place during the a.m. peak (–26 percent). Changes in vehicle counts were nearly identical for the afternoon off-peak period and the afternoon peak period: -23 percent and –22 percent, respectively (Table 2).

**Figure 1: Vehicle Counts, Mt. Vernon Elementary School**

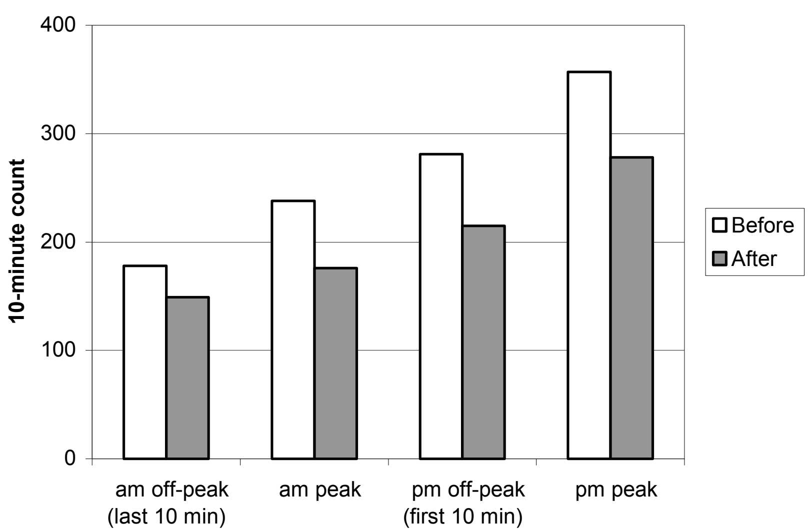


**Table 2: Vehicle Counts, Mt. Vernon Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 178 | 149 | -16% |
| **a.m. peak** | 238 | 176 | -26% |
| **p.m. off-peak** | 281 | 215 | -23% |
| **p.m. peak** | 357 | 278 | -22% |

### *Vehicle speeds*

Like vehicle counts, average vehicle speeds are reported with respect to off-peak values, that is, the average speeds observed over the last ten minutes of the morning period and the first ten minutes of the afternoon period. Off-peak vehicle speeds more closely reflect average velocities for non-drop off and pick-up hours. *Peak* velocities—the lowest ten-minute mean speeds averaged over the two-day observation period—are also provided for the morning and afternoon, pre- and post-construction periods. The error bars in Figure 2 are based on an assumed human accuracy of +/- 0.3 seconds in the measurement of travel time used to calculate vehicle speed. The researchers believe this is, if anything, an overestimate of the level of human inaccuracy involved in the speed measurements.

Off-peak speeds on Mount Vernon Avenue in the morning observation period marginally decreased from 32.88 mph in the pre-construction period to 31.00 mph after construction, yet yielded an increase in percentage decreased 6 percent. The peak a.m. average velocities before and after project construction decreased from 29.17 mph to 28.91 mph (a decrease of 1 percent). Afternoon off-peak speeds decreased from 29.54 mph before construction to 29.17 mph (a decrease of 1 percent) after project construction. The peak p.m. velocities followed a similar trend, decreasing from 25.00 mph during pre-construction to a post-construction average speed of 24.77 mph (a decrease of 1 percent) (Table 3).

**Figure 2: Average Vehicle Speeds, Mt. Vernon Elementary School**

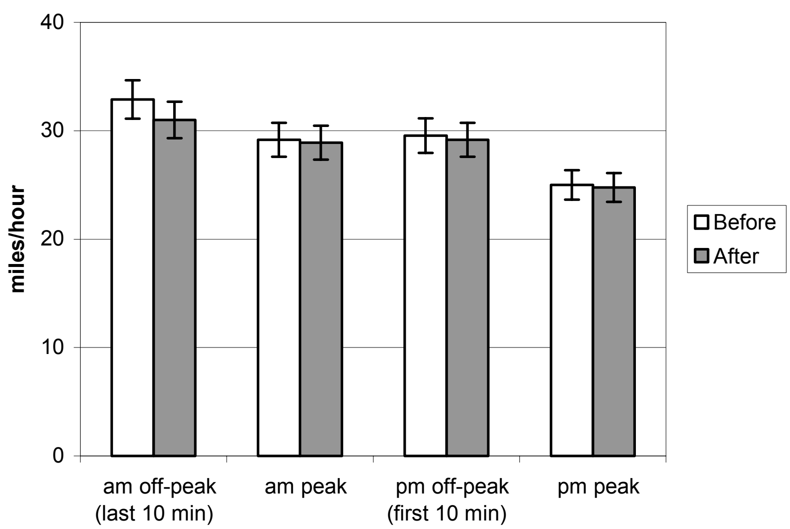


**Table 3: Average Vehicle Speeds, Mt. Vernon Elementary School**

| | Before (mph) | After (mph) | % Change |
|---|---|---|---|
| **a.m. off-peak** | 32.88 | 31.00 | -6% |
| **a.m. peak** | 29.17 | 28.91 | -1% |
| **p.m. off-peak** | 29.54 | 29.17 | -1% |
| **p.m. peak** | 25.00 | 24.77 | -1% |

### *Pedestrian and cyclist counts*

*Off-peak* and *peak* count measures are reported for combined pedestrian and cyclist traffic. Figure 3 plots these values for Mt. Vernon Elementary School. The off-peak count increased from 0.5 (pre-construction) to 4.5 (post-construction) in the morning period and decreased from 8.5 (pre-construction) to 4.0 (post-construction) in the afternoon period. The pre-construction, peak values were higher in both the morning (9.5) and afternoon (43.0) periods compared to the post-construction values of 9.0 and 27.5 respectively.

Off-peak counts for pedestrians and cyclists were moderately low overall, with most activity clustered in the afternoon. Following the construction of the SR2S project, it appears as though the percentage of pedestrian and cyclist activity has decreased, with the most changes occurring in the afternoon (a decrease of 53 percent and 36 percent for p.m. off-peak and p.m. peak, respectively) (Table 4).

**Figure 3: Child Pedestrian and Cyclist Counts, Mt. Vernon Elementary School**

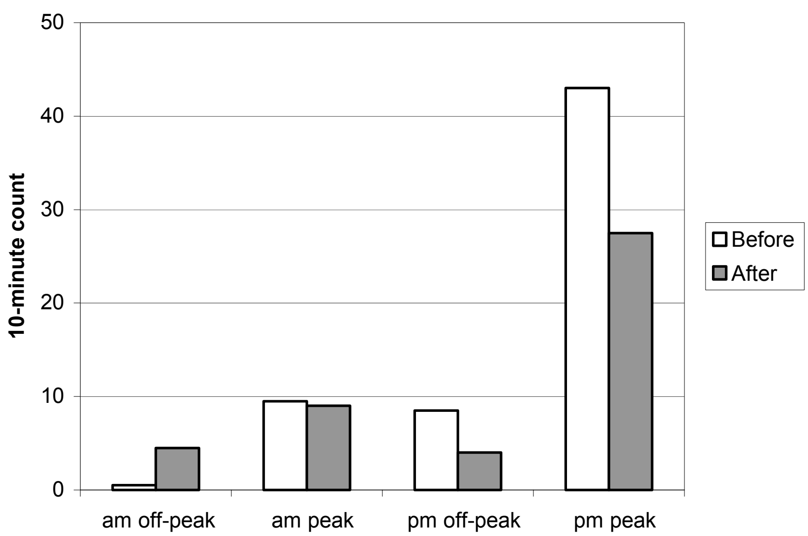


**Table 4: Child Pedestrian and Cyclist Counts, Mt. Vernon Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 0.5 | 4.5 | 800% |
| **a.m. peak** | 9.5 | 9.0 | -5% |
| **p.m. off-peak** | 8.5 | 4.0 | -53% |
| **p.m. peak** | 43.0 | 27.5 | -36% |

### *Location of pedestrians*

Researchers monitored the locations of pedestrians relative to the sidewalk or street during 45-minute morning and afternoon observation periods. Figure 4 plots the number of pedestrians who used either: (1) a sidewalk and/or path separated from the street; or (2) a street and/or street shoulder.

Table 5 shows that child pedestrians utilized the sidewalk and/or path to get to and from school, but they did not use the shoulder or street. The number of child pedestrians that used a sidewalk or path decreased from 193 to 137 (a 29 percent decrease) after sidewalks were installed.

**Figure 4: Child Pedestrian Locations, Mt. Vernon Elementary School**

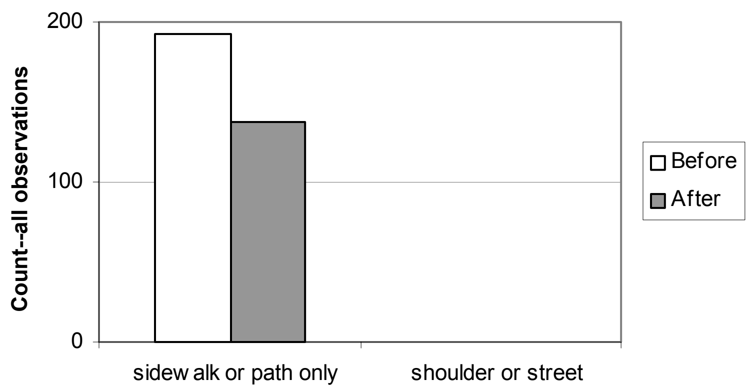



**Table 5: Child Pedestrian Locations, Mt. Vernon Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **Sidewalk or path only** | 193 | 137 | -29% |
| **Shoulder or street** | 0 | 0 | |
| ***Total child pedestrians*** | ***193*** | ***137*** | ***-29%*** |

### *Yielding behavior*

The final facet of the traffic analysis was to document whether automobile drivers adequately yield to pedestrians and cyclists. This behavior was indicated with a basic yes or no: the former specifies that the driver obeyed traffic laws, and waited, if obligated, for the pedestrian or cyclist to proceed safely across the intersection, and the latter suggests that the driver encroached on the pedestrian's path, thereby forcing the person to yield to the motorized vehicle. Figure 5 shows that 97 percent of the observed drivers (four of 144) yielded during the before project construction observation period, while the percentage of observed drivers who yielded after the project construction decreased to 93 percent (Table 6).

**Figure 5: Yielding Behavior, Mt. Vernon Elementary School**

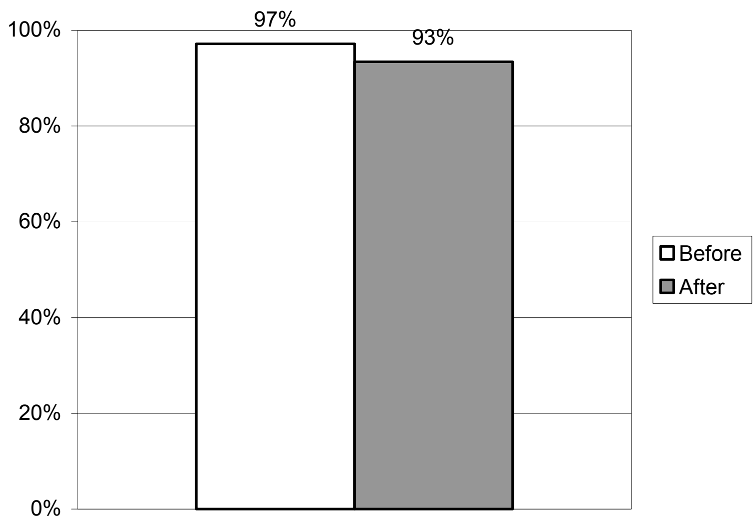



**Table 6: Yielding Behavior, Mt. Vernon Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Yielded** | 140 (97%) | 86 (93%) | |
| **Did not yield** | 4 | 6 | |
| ***Total*** | ***144*** | ***92*** | |

## III. Survey results

This section of the analysis examines parents' responses to take-home surveys that were distributed before and after project construction. The surveys solicited demographic information such as household size, employment status, and household income, as well as numerous transportation-related responses. Parents were asked to identify the transportation mode their child uses for their journey to and from school, parents' assessment of the SR2S construction project, and whether or not the construction project was likely to change their children's travel behavior. A total of 179 pre-construction (68.85 percent) and 138 (54.12 percent) post-construction surveys were completed by parents of Mt. Vernon Elementary School students. A summary of these responses is provided below.

### *Demographic information*

Table 7 describes the households that completed the survey. The researchers wish to emphasize that the before and after values were drawn from two different surveys and two different samples. Therefore, the percentage change of these variables should be interpreted more as a measure of variation between the samples rather than a real change in the population’s characteristics.

**Table 7: Demographic Characteristics of Households, Mt. Vernon Elementary School**

| | Before | After | Change |
|---|---|---|---|
| ***Average age of child for whom survey was completed*** | 9.01 | 8.70 | -0.31 |
| ***Sex of child (% female)*** | 41.90% | 50.00% | 0.08% |
| ***Average grade of child*** | 3.92 | 4.13 | 0.21 |
| ***Percentage of population living with spouse or significant other*** | 59.78% | 73.19% | 13.41% |
| ***Average number of persons in house*** | 5.47 | 5.27 | -0.20 |
| ***Average number of persons between 6 and 16 years of age*** | 2.41 | 2.24 | -0.17 |
| ***Average number of licensed drivers in household*** | 1.46 | 1.32 | -0.14 |
| ***Average number of cars in household*** | 1.42 | 1.54 | 0.12 |
| ***Average number of persons working full- or part-time*** | 1.45 | 1.39 | -0.06 |
| ***Average number of persons working 20 hours per week or more*** | 1.41 | 1.35 | -0.06 |
| ***Average number of years parent in school*** | 9.58 | 9.57 | -0.01 |
| ***Annual Household Income*** | | | |
| **$15,000 or less** | 73 (40.78%) | 42 (30.43%) | -31 (-10.35%) |
| **$15,001 to $35,000** | 57 (31.84%) | 56 (40.58%) | -1 (8.74%) |
| **$35,001 to $55,000** | 21 (11.73%) | 16 (11.59%) | -5 (-0.14%) |
| **$55,001 to $75,000** | 4 (2.23%) | 0 (0.00%) | -4 (-2.23%) |
| **$75,001 or more** | 1 (0.56%) | 1 (0.72%) | 0 (0.17%) |
| **No response** | 23 (12.85%) | 23 (16.67%) | 0 (3.82%) |
| ***Years living in neighborhood*** | | | |
| **Under 1 year** | 21 (11.73%) | 32 (23.19%) | 11 (11.46%) |
| **1 to 5 years** | 71 (39.66%) | 58 (42.03%) | -13 (2.36%) |
| **6 to 10 years** | 28 (15.64%) | 17 (12.32%) | -11 (-3.32%) |
| **Over 10 years** | 29 (16.20%) | 17 (12.32%) | -12 (-3.88%) |
| **Whole life** | 20 (11.17%) | 3 (2.17%) | -17 (-9.00%) |
| **No response** | 10 (5.59%) | 11 (7.97%) | 1 (2.38%) |
| ***Years living in U.S.*** | | | |
| **Under 1 year** | 3 (1.68%) | 1 (0.72%) | -2 (-0.95%) |
| **1 to 5 years** | 7 (3.91%) | 14 (10.14%) | 7 (6.23%) |
| **6 to 10 years** | 23 (12.85%) | 29 (21.01%) | 6 (8.17%) |
| **Over 10 years** | 75 (41.90%) | 49 (35.51%) | -26 (-6.39%) |
| **Whole life** | 67 (37.43%) | 41 (29.71%) | -26 (-7.72%) |
| **No response** | 4 (2.23%) | 4 (2.90%) | 0 (0.66%) |
| ***Born in U.S. (%)*** | 33.52% | 20.29% | -13.23% |

Overall, the students of Mt. Vernon Elementary School come from relatively large households (an average of 5 persons per household) and have nominal mobility potentials such that each household has an average 1.54 cars and 1.32 licensed drivers. Approximately 71 percent of these households earn a modest income of $35,000 per annum or less whereas less than 1 percent earns more than $75,000 (Figure 6 and Table 5). Approximately two-thirds of the respondents have lived in their present neighborhood for less than five years and 31.87 percent have lived in the U.S. ten years or less.

The data suggest that, in some instances, the population sampled could be different before and after the construction project. For example, the percentage of the population living with a spouse or significant other increased by 13.41 percent before and after the construction period. In addition, the percentage of those living in the neighborhood for less than a year and those living their whole life in the neighborhood were roughly equal: about 11 percent. After construction, though, the percentage of people living under 1 year in the neighborhood increased by 11.46 percent, whereas those living their whole life in the neighborhood decreased by 9.00 percent.

### *Distance from school*

Before project construction, 59.78 percent of parents responded that they lived less than one mile away from their child's school (see Figure 6 and Table 8). About 6 percent lived more than 1 mile away and almost 35 percent did not know or did not answer the question. After project construction, the percentage of parents who responded that they lived less than one mile away declined 7.6 percent, to 52.18 percent. Accordingly, the percentage of parents responding that they lived more than one mile away increased, to about 8 percent, in addition to the percentage of parents who did not know or who did not respond, to 39.86 percent.

**Figure 6: Distance From School, Mt. Vernon Elementary School**

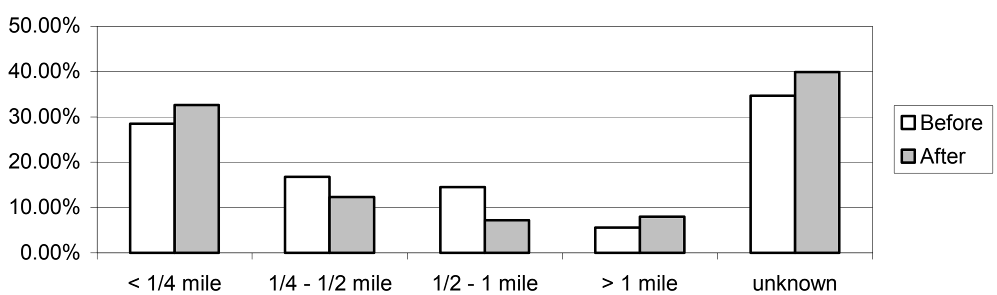


**Table 8: Distance From School, Mt. Vernon Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **< 1/4 mile** | 51 (28.49%) | 45 (32.61%) | -6 (4.12%) |
| **1/4 - 1/2 mile** | 30 (16.76%) | 17 (12.32%) | -13 (-4.44%) |
| **1/2 - 1 mile** | 26 (14.53%) | 10 (7.25%) | -16 (-7.28%) |
| **> 1 mile** | 10 (5.59%) | 11 (7.97%) | 1 (2.38%) |
| **Unknown** | 62 (34.64%) | 55 (39.86%) | -7 (5.22%) |

### *Transportation mode splits*

In terms of mode split, 51.96 percent of students were driven to school in a private vehicle whereas 41.90 percent walked or bicycled to school before project construction. Less than 1 percent used public transit and 5.59 percent of students used other modes of transportation or who had missing responses (Figure 7 and Table 9). Once construction had been completed, the share of students driven to and from school decreased marginally (51.45 percent vs. 51.96 percent before and after, respectively) while the amount of students walking and biking increased (44.20 percent vs. 41.90 percent before and after, respectively). The percentage of children taking public transportation dropped to zero whereas the percentage of students using other modes of transportation or who had missing responses decreased by 1.24 percent.

**Figure 7: Transportation Mode Splits for Commutes to School, Mt. Vernon Elementary School**

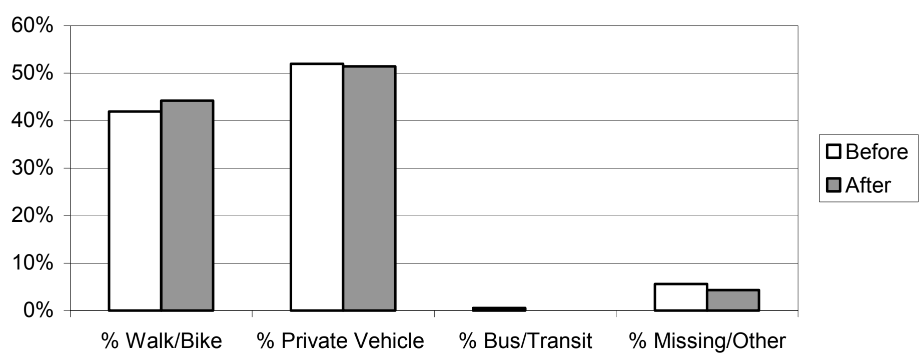



**Table 9: Transportation Mode Splits for Commutes to School, Mt. Vernon Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Walk/Bike** | 75 (41.90%) | 61 (44.20%) | -14(2.30%) |
| **Private Vehicle** | 83 (51.96%) | 71 (51.45%) | -22 (-0.51%) |
| **Bus/Transit** | 1 (0.56%) | 0 (0.00%) | -1 (-0.56%) |
| **Missing/Other** | 10 (5.59%) | 6 (4.35%) | -4 (-1.24%) |

### *Transportation mode splits by distance from school*

When families lived less than a quarter mile away from the school, 48.89 percent of children were both driven by private vehicle and walked or biked (Figure 8 and Table 10). Beyond a quarter mile, though, the percentage of children driven in a private vehicle increased to 50 percent and above, with a maximum of 72.73 percent of children living more than a mile from school being driven in a private vehicle. Bus and transit was not a transportation mode used by children. Children who took other modes of transportation, or whose parents did not provide a response to this question, were negligible: 1 response each for children living less than one-quarter of a mile, between one-quarter and one-half, and between one-half and one mile, respectively; and 3 responses for unknown.

**Figure 8: Transportation Mode Splits for Commutes to School by Distance from School, Mt. Vernon Elementary School**

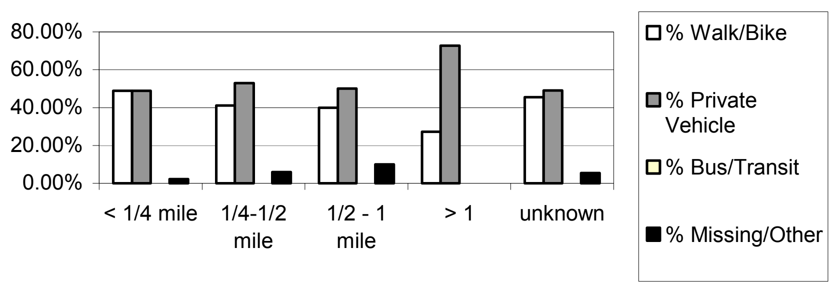



**Table 10: Transportation Mode Splits for Commutes to School by Distance from School, Mt. Vernon Elementary School**

| | < 1/4 mile | 1/4-1/2 mile | 1/2 - 1 mile | > 1 | unknown |
|---|---|---|---|---|---|
| **Walk/Bike** | 22 (48.89%) | 7 (41.18%) | 4 (40.00%) | 3 (27.27%) | 25 (45.45%) |
| **Private Vehicle** | 22 (48.89%) | 9 (52.94%) | 5 (50.00%) | 8 (72.73%) | 27 (49.09%) |
| **Bus/Transit** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **Missing/Other** | 1 (2.22%) | 1 (5.88%) | 1 (10.00%) | 0 (0.00%) | 3 (5.45%) |

### *Location of SR2S construction project relative to survey respondents*

Among survey respondents, 10 parents said their child walked to school more often after the SR2S project completion, while 19 parents said their child walked to school less often after SR2S project completion. Breaking these changes down depending on whether or not the SR2S project was along the child’s usual route to school reveals differences. In cases where the parents said the project was along the usual route to school, 8 children were reported as walking more and 11 walked less compared with pre-construction. In cases where the parents said the project was not along the child’s usual route to school, 2 children were reported as walking more and 8 were reported as walking less. Note that these are reports based on the parental surveys, not observations of children. Also note that the survey did not ask parents, in this question, to assess whether the SR2S project caused their child to walk more or less; the survey simply asked whether the child walked to/from school more or less compared to a year ago.

**Figure 9: Project Along Usual Route vs. Percentage Walked, Mt. Vernon Elementary School**

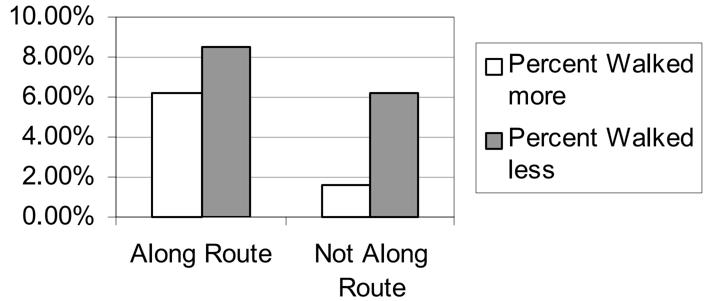



**Table 11: Project Along Usual Route vs. Percentage Walked, Mt. Vernon Elementary School**

| | Along Route | Not Along Route |
|---|---|---|
| **Percent walked more** | 8 (6.20%) | 2 (1.55%) |
| **Percent walked less** | 11 (8.53%) | 8 (6.20%) |

### *Parents' perceptions of effects of SR2S construction project*

Results of the Mt. Vernon after-construction survey suggest that parents have a moderately positive opinion about the project. Specifically, 65.22 percent of parents noticed the project. A majority of parents feel that the project produced favorable results such easing street crossings (74.64 percent), making walking and biking safer (71.01 percent), and making motorists more aware of children along the road (63.77 percent). (Figure 10 and Table 12). Moreover, 82 of the 138 respondents believe that the project is important or the most important project to be built (Figure 9 and Table 8). However, only slightly more than half of the parents believed that the project slowed car traffic near the school and that the project helped to separate children and cars on the route to school (55.80 percent for both). About 49 percent of parents believed the project was along their child's route to school.

These moderately positive perceptions are substantiated by a 5.41 percent decrease in the number of children who would cross a road with more than four lanes of traffic and a 6.81 percent decrease in the number of children who would cross an intersection without a painted crosswalk. Furthermore, the percentage of parents who feel their children are very likely to walk to school in the next two months decreased 10.00 percent after the project was completed. In contrast, the percentage of parents who felt it was very unlikely that their children would walk to school increased 7.77 percent after construction.

**Figure 10: Perceived Effects of Project, Mt. Vernon Elementary School**

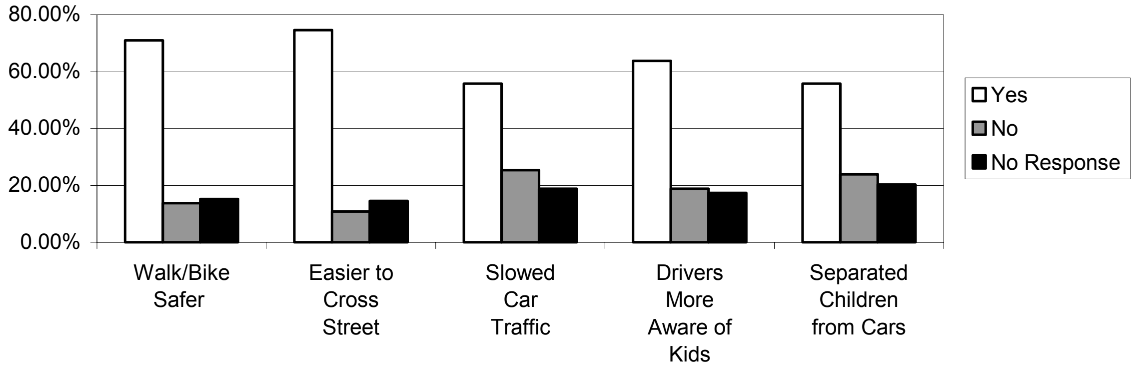



**Table 12: Perceived Effects of Project, Mt. Vernon Elementary School**

| | Yes | No | No Response |
|---|---|---|---|
| **Walk/bike safer** | 98 (71.01%) | 19 (13.77%) | 21 (15.22%) |
| **Easier to cross street** | 103 (74.64%) | 15 (10.87%) | 20 (14.49%) |
| **Slows car traffic** | 77 (55.80%) | 35 (25.36%) | 26 (18.84%) |
| **Drivers more aware of children** | 88 (63.77%) | 26 (18.84%) | 24 (17.39%) |
| **Separates children from cars** | 77 (55.80%) | 33 (23.91%) | 28 (20.29%) |

### *Parents' perceptions of importance of SR2S construction project*

Figure 11 shows that 59.42 percent of the respondents feel the project is the most important or an important construction project that could have been built. In contrast, 8.70 percent believe that the project was less important or not important. Forty-four of the 138 respondents did not give a response, which is more than the amount of respondents stating that they believed the project was the most important project to have been built (Table 13)

**Figure 11: Perceived Importance of Project, Mt. Vernon Elementary School**

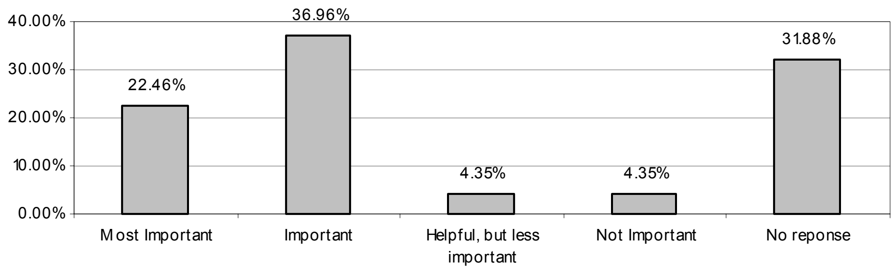



**Table 13: Perceived Importance of Project, Mt. Vernon Elementary School**

| | |
|---|---|
| **Most Important** | 31( 22.46%) |
| **Important** | 51 (36.96%) |
| **Helpful, but less important** | 6 (4.35%) |
| **Not Important** | 6 (4.35%) |
| **No response** | 44 (31.88%) |

## Murrieta Elementary School

### I. School location and project description

24725 Adams Ave.
Murrieta, CA 92562
Contact: Mike Lorimer, Principal
Phone: (909) 696-1401
Fax: (909) 696-1445

Grades: K-5
School Population: 651
Average class size: 21.6

Ethnic Makeup:
Asian: 1.5%
Hispanic: 22.9%
African American: 3.8%
White: 69.9%
City population (Murrieta): 46,850
U.S. Census Classification: “Rural area (metropolitan)”

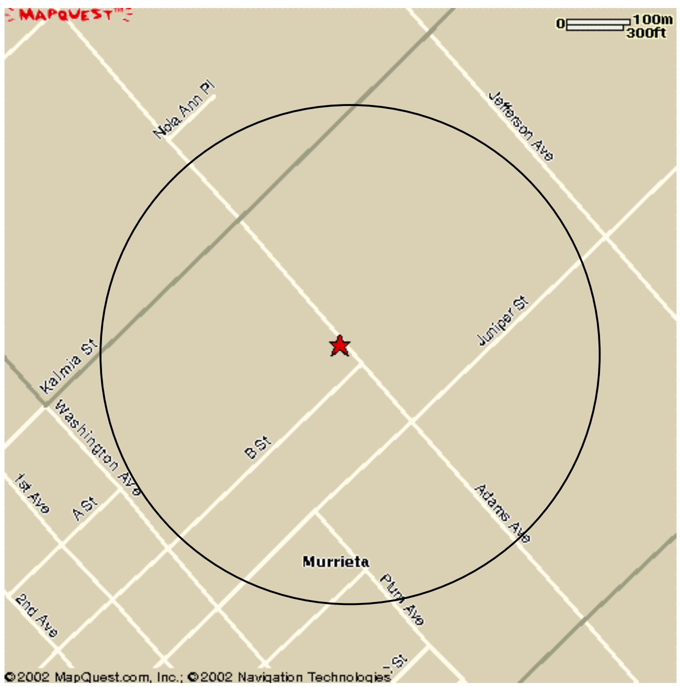
**Date Observed:** 09/24/02 and 09/27/02 (before construction); 05/21/03 and 05/23/03 (after construction)

**Project type**: Sidewalk improvements and bicycle facilities

***Description of the neighborhood***

This neighborhood is in the City of Murrieta. It is a suburban neighborhood on a rural edge. The neighborhood has a mix of residential, commercial and civic land uses, characterized by large lots and long blocks. The neighborhood appears to be changing from a rural agricultural/ranch area to a bedroom community of Orange, Riverside, and San Diego Counties. The city is currently constructing civic building and public space in large lot across from school. Recreation fields and community center are near to the school, as are some small businesses and churches. A busy arterial is near the school.

The project is located on Adams Avenue, "B" Street, 2nd Street, and Kalmia Street. There is a general lack of concrete sidewalk and gutters separating pedestrians from automobile traffic in this growing area. Construction of sidewalk and bicycle facilities was proposed to cost $453,938.




Star indicates location of elementary school; Circle represents portion of neighborhood included in the study (approx. 1/4 mile radius from the elementary school).


Murrieta Elementary School

Adams Avenue before improvement


Adams Avenue after bike lane improvement

Adams Avenue after sidewalk installation

### *Neighborhood characteristics*

Based on before-construction observations of the quarter-mile area surrounding Murrieta Elementary School, this neighborhood has the following urban design characteristics, which are potentially related to pedestrian activity and traffic safety in the area.

**Table 1: Urban Design Characteristics, Murrieta Elementary School**

| | |
|---|---|
| ***Urban Design Elements Associated with Perceptions of Traffic Safety*** | |
| **Blocks with a complete sidewalk** | 8% |
| **Blocks with a complete buffered, sidewalk** | 8% |
| **Blocks with bike lanes** | 0% |
| **Blocks with bike lanes separated from the street** | 0% |
| ***Urban Design Elements Associated with Perceived Crime Safety*** | |
| **Blocks with first floor windows visible from the street** | 46% |
| **Blocks with street lighting** | 0% |
| **Blocks where abandoned buildings were absent** | 100% |
| **Blocks where rundown buildings were absent** | 100% |
| **Blocks where vacant lots were absent** | 42% |
| **Blocks where graffiti was absent** | 100% |
| **Blocks where undesirable land uses were absent** | 100% |
| ***Urban Design Elements Associated with Traffic Volume, Flow and Speed*** | |
| **Average number of traffic lanes within a block** | 2 |
| **Average street width of a block (in ft.)** | 33 |
| **Average block length of a block (in ft.)** | 879 |
| **Average sidewalk width of a block (in ft.)** | 6 |
| **Blocks with traffic circles** | 0% |
| **Blocks with bulbouts** | 0% |
| **Blocks with speed bumps** | 0% |
| **Blocks with cul-de-sacs** | 0% |
| **Blocks with medians** | 0% |
| **Blocks with paving treatments** | 0% |
| ***Urban Design Elements Associated with Walkability*** | |
| **Blocks with street trees** | 0% |
| **Blocks with mixed uses** | 72% |
| **Blocks with public space** | 23% |
| **Blocks with street furniture** | 0% |

## II. Traffic analysis

Murrieta Elementary is located on Adams Avenue at the corner of Kalmia Street. Pre-construction vehicle and pedestrian data were gathered along Adams Avenue near Kalmia Street, and pedestrian data were gathered at the corner of Adams and Kalmia on September 24 and September 27, 2002. Post-construction data were gathered on May 21 and May 23, 2003. Morning and afternoon observation periods (45-minute each) commenced at 8:15 a.m. and 2:45 p.m. respectively, which coincide with the peak flows of school traffic.

### *Vehicle counts*

Figure 1 plots the combined volume of traffic along Adams Avenue for the morning and afternoon, pre- and post-construction periods. *Off-peak* values represent the total number of vehicles observed over the last ten minutes of the morning period or the first ten minutes of the afternoon period (these periods typically coincide most closely with traffic patterns outside of school drop off and pick up times). *Peak* values represent the sum of vehicles counted over the ten-minute period with the greatest traffic volume.

In the “before” construction period, off-peak values included 22.5 cars in the morning drop off, and 41.0 cars in the afternoon. Before construction peak values included 159.0 cars in the morning drop off, and 72.5 cars in the afternoon. After construction, morning off-peak values increased to 51.5 (an increase of 129 percent) and afternoon off-peak values dropped to 29.5 cars (a decrease of 28 percent). Morning peak values remained unchanged after construction, and afternoon peak values increased to 89.5 (an increase of 23 percent).

These results show no consistent changes in vehicle counts before and after the construction project. This finding is not surprising, since the SR2S construction project at Murrieta School, which included sidewalk installations and bicycle facilities, should not have any obvious impact on the number of vehicles near school (Table 2).

**Figure 1: Vehicle Counts, Murrieta Elementary School**

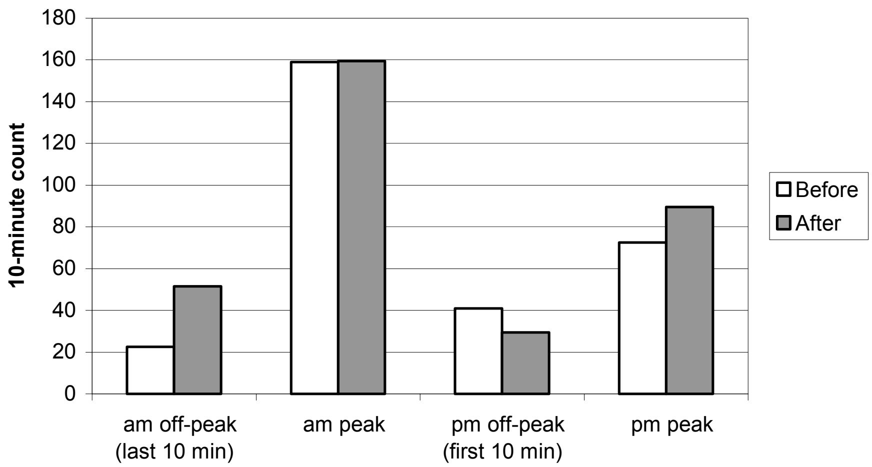



**Table 2: Vehicle Counts, Murrieta Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **am off-peak** | 22.5 | 51.5 | 128.9% |
| **am peak** | 159.0 | 159.5 | 0.3% |
| **pm off-peak** | 41.0 | 29.5 | -28.0% |
| **pm peak** | 72.5 | 89.5 | 23.4% |

### *Vehicle speeds*

Like vehicle counts, average vehicle speeds are reported with respect to off-peak values, that is, the average speeds observed over the last ten minutes of the morning period and the first ten minutes of the afternoon period, when vehicle speeds are typically closest to those for non-drop off and pick-up hours. *Peak* speed is the average speed for the slowest 10-minute interval. These are also provided for the morning and afternoon, pre- and post-construction phases. Figure 2 reports these values with 1/3-second error bars (indicated by brackets at the top of each column in the chart). The error bars in Figure 2 are based on an assumed human accuracy of +/- 0.3 seconds in the measurement of travel time used to calculate vehicle speed. The researchers believe this is, if anything, an overestimate of the level of human inaccuracy involved in the speed measurements.

Before construction, morning off-peak vehicle speeds averaged 31.2 mph; morning peak speeds before construction averaged 22.7 mph. Also before construction, afternoon off-peak vehicle speeds averaged 30.7 mph., while afternoon peak speeds averaged 29.6 mph. After construction of SR2S improvements, morning off-peak vehicle speeds averaged 24 mph, and morning peak speeds remained essentially the same, at 22.2 mph. After construction speeds for the afternoon included an average speed of 22 mph for the off-peak period, and an average speed of 19.7 mph. for the afternoon peak.

After construction speeds for these four periods were generally lower (morning off-peak, afternoon off-peak, and afternoon peak speeds) or remained unchanged (morning peak speeds), compared with before construction speeds. Also noteworthy is the fact that average speeds exceeded 30 mph. for only two periods (morning and afternoon off-peak periods, before construction) (Table 3).

**Figure 2: Average Vehicle Speeds, Murrieta Elementary School**

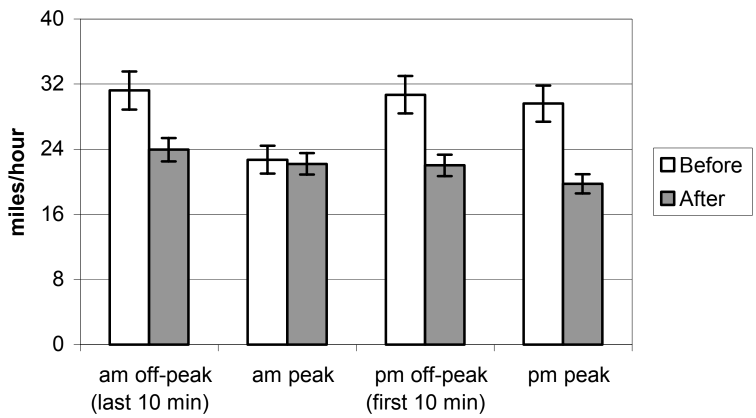



**Table 3: Average Vehicle Speeds, Murrieta Elementary School**

| | Before (mph) | After (mph) | % Change |
|---|---|---|---|
| **a.m. off-peak** | 31.22 | 23.95 | -23% |
| **a.m. peak** | 22.71 | 22.20 | -2% |
| **p.m. off-peak** | 30.68 | 22.02 | -28% |
| **p.m. peak** | 29.61 | 19.74 | -33% |

### *Pedestrian and cyclist counts*

*Baseline* and *peak* count measures are reported for pedestrian and cyclist traffic. Figure 3 plots these values for Murrieta Elementary School.

Few children walked or bicycled to Murrieta Elementary School before or after construction of the SR2S improvement. Before construction, morning off-peak and peak pedestrian and cyclist counts included 0 and 0.5 children, respectively. Before construction afternoon counts also revealed few children walking or bicycling, including a off-peak rate of 0.5 children and a peak rate of 1.5 children. After construction, rates of walking and bicycling were slightly higher, including a rate of 1 child (each) for the morning off-peak period, morning peak period, and afternoon off-peak period, and a rate of 13 children walking or bicycling for the afternoon peak period. These after construction rates of walking and bicycling reveal modest but consistent increases (Table 4).

**Figure 3: Child Pedestrian and Cyclist Counts, Murrieta Elementary School**

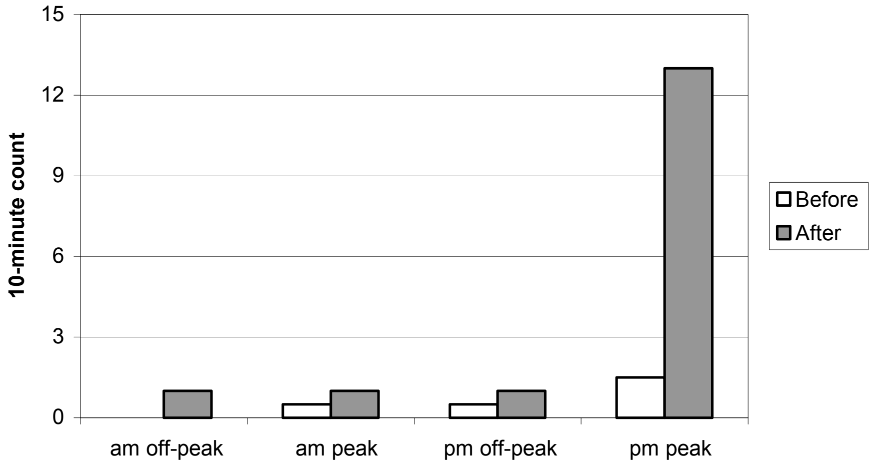



**Table 4: Child Pedestrian and Cyclist Counts, Murrieta Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **am off-peak** | 0.0 | 1.0 | |
| **am peak** | 0.5 | 1.0 | 100% |
| **pm off-peak** | 0.5 | 1.0 | 100% |
| **pm peak** | 1.5 | 13.0 | 767% |

### *Location of pedestrians*

The location of walking activity (relative to the sidewalk or street) was observed during the 45-minute morning and afternoon observation periods. Table 4 and Figure 5 report the number of pedestrians who were observed on: (1) sidewalks (paved surfaces separated from the street); (2) paths (non-paved surfaces separated from the street); (3) street shoulders; and (4) directly on streets. Note that pedestrians were counted multiple times if they utilized more than one type of walkway.

Findings demonstrate that the few children walking near Murrieta School consistently used the sidewalk, including a total of 2 child pedestrians before construction, and 18 child pedestrians after construction. In addition, only 1 child pedestrian used the shoulder or street after construction as compared with 0 child pedestrians before construction.

**Figure 4: Child Pedestrian Locations, Murrieta Elementary School**

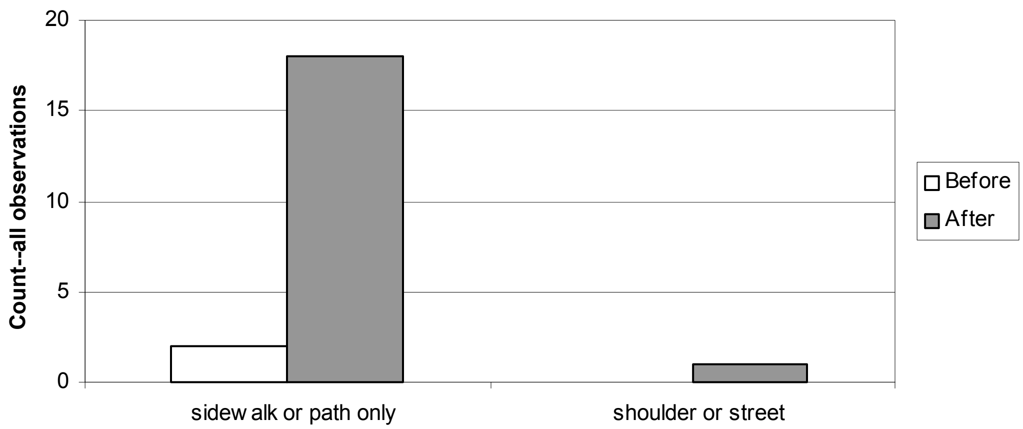



**Table 5: Child Pedestrian Locations, Murrieta Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **Sidewalk or path only** | 2 | 18 | 800% |
| **Shoulder or street** | 0 | 1 | |
| ***Total child pedestrians*** | 2 | 19 | 850% |

### *Yielding behavior*

The final facet of the traffic analysis was to document whether automobile drivers adequately yielded to pedestrians and cyclists. This behavior was indicated with a simple yes or no: the former specifies that the driver obeyed traffic laws, and waited, if obligated, for the pedestrian or cyclist. The latter suggests that the driver encroached on another's path when he or she was legally obligated to yield.

Few opportunities for yielding were recorded in observations at Murrieta School. Of these, yielding behavior was consistently high, including 86 percent (6 of 7 instances) before construction, and 93 percent (13 of 14 instances) after construction. Again, it is not clear that the SR2S construction improvements to sidewalks and bicycle facilities should have had any impact on yield behavior, except perhaps by making bicyclists and pedestrians easier for drivers to spot.

**Figure 5: Yielding Behavior,  Murrieta Elementary School**

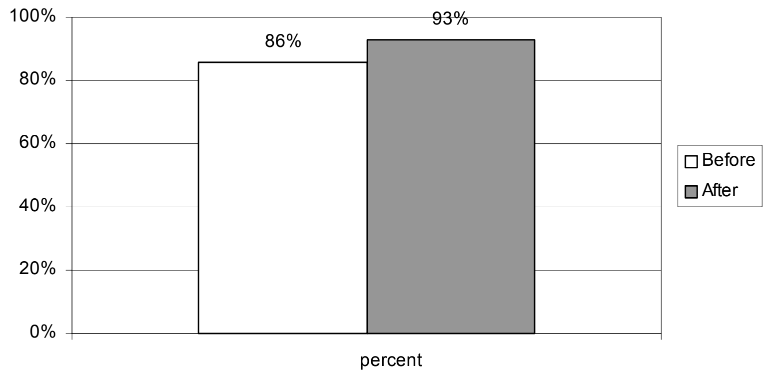



**Table 6: Yielding Behavior, Murrieta Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Yielded** | 6 (86%) | 13 (93%) | 7% |
| **Did not yield** | 1 | 1 | 0% |
| **Total** | ***7*** | ***14*** | |

## III. Survey results

This section of the analysis examines parents' responses to take-home surveys that were distributed before and after project construction. The surveys solicited demographic information such as household size, employment status, and household income, as well as numerous transportation-related responses. Parents were asked to identify the transportation mode their child uses for their journey to and from school, parents' assessment of the SR2S construction project, and whether or not the construction project was likely to change their children's travel behavior. A total of 223 pre-construction surveys (53.61 percent response rate) and 125 post-construction surveys (29.34 percent response rate) were completed by parents of Murrieta Elementary School students. A summary of these responses is provided below.

### *Demographic information*

Table 7 summarizes demographic attributes gleaned from the pre- and post-construction survey responses. The investigators wish to emphasize that the before and after values were drawn from two different surveys and two different samples. Therefore, the percentage change of these variables should be interpreted more as a measure of variation between the samples rather than a real change in the population's characteristics.

**Table 7: Demographic Characteristics of Households, Murrieta Elementary.**

| | Before | After | Change |
|---|---|---|---|
| ***Average age of child for whom survey was completed*** | 9.00 | 9.69 | 0.69 |
| ***Sex of child (% female)*** | 56.05% | 51.20% | -0.05% |
| **Average grade of child** | 3.89 | 3.98 | 0.09 |
| ***Percentage of population living with spouse or significant other*** | 87.44% | 87.20% | -0.24% |
| ***Average number of persons in household*** | 4.74 | 5.42 | 0.68 |
| ***Average number of persons between 6 and 16 years of age*** | 2.13 | 1.94 | -0.19 |
| ***Average number of licensed drivers in household*** | 2.17 | 2.26 | 0.09 |
| ***Average number of cars in household*** | 2.32 | 2.42 | 0.10 |
| ***Average number of persons working full- or part-time*** | 1.62 | 1.71 | 0.09 |
| ***Average number of persons working 20 hours per week or more*** | 1.54 | 1.49 | -0.05 |
| ***Average number of years parent in school*** | 13.81 | 14.12 | 0.31 |
| **Annual Household Income** | | | |
| **$15,000 or less** | 8 (3.59%) | 4 (3.20%) | -4 (-.39%) |
| **$15,001 to $35,000** | 22 (9.87%) | 9 (7.20%) | -13 (-2.67%) |
| **$35,001 to $55,000** | 26 (11.66%) | 17 (13.60%) | -9 (1.94%) |
| **$55,001 to $75,000** | 50 (22.42%) | 21 (16.80%) | -29 (-5.62%) |
| **$75,001 or more** | 97 (43.50%) | 57 (45.60%) | -40 (2.10%) |
| **No response** | 20 (8.97%) | 17 (13.60%) | -3 (4.63%) |
| **Years living in neighborhood** | | | |
| **Under 1 year** | 53 (23.77%) | 25 (20.00%) | -28 (-3.77%) |
| **1 to 5 years** | 89 (39.91%) | 55 (44.00%) | -34 (4.09%) |
| **6 to 10 years** | 349 15.25%) | 17 (13.60%) | -17 (-1.65%) |
| **Over 10 years** | 41 (18.39%) | 21 (16.80%) | -20 (-1.59%) |
| **Whole life** | 2 (0.90%) | 3 (2.40%) | 1 (1.50%) |
| **No response** | 4 (1.79%) | 4 (3.20%) | 0 (1.41%) |
| **Years living in U.S.** | | | |
| **Under 1 year** | 0 (0.00%) | 2 (1.60%) | 2 (1.60%) |
| **1 to 5 years** | 4 (1.79%) | 0 (0.00%) | -4 (-1.79%) |
| **6 to 10 years** | 2 (0.90%) | 0 (0.00%) | -2 (-.90%) |
| **Over 10 years** | 31 (13.90%) | 12 (9.60%) | -19 (-4.30%) |
| **Whole life** | 181 (81.17%) | 105 84.00%) | -76 (2.83%) |
| **No response** | 5 (2.24%) | 6 (4.80%) | 1 (2.56%) |
| ***Born in U.S. (%)*** | 81.17% | 81.60% | 0.43% |

Respondents for Murrieta Elementary School had completed approximately two years of education after high school, on average). The great majority (87.44 percent) lived with their spouse or significant other. Most respondents (65.92 percent) had annual household incomes of over $55,000, and most had been born in the US (81.60 percent of respondents). Over 63 percent of respondents had lived in their current neighborhood for five years or less.

Overall, the sample for the after construction survey referenced slightly older children (9.69 years vs. 9.00 years) and a slightly lower percentage of female children (51.20 percent female vs. 56.05 percent female), compared to the sample for the before construction survey. Respondents for the after construction survey had slightly more drivers and more cars in their households, by a difference of approximately 10 percent in each instance.

### *Distance from school*

Approximately half of survey respondents reported that they lived over a mile from Murrieta School both before and after project construction. This fact may at least partly explain the low counts of children pedestrians and cyclists near school, even after completion of the SR2S construction project. Only 16.80 percent of respondents lived within half mile of Murrieta School—this distance is typically considered a feasible journey for children to walk to school.

**Figure 6. Distances From School, Murrieta Elementary School**

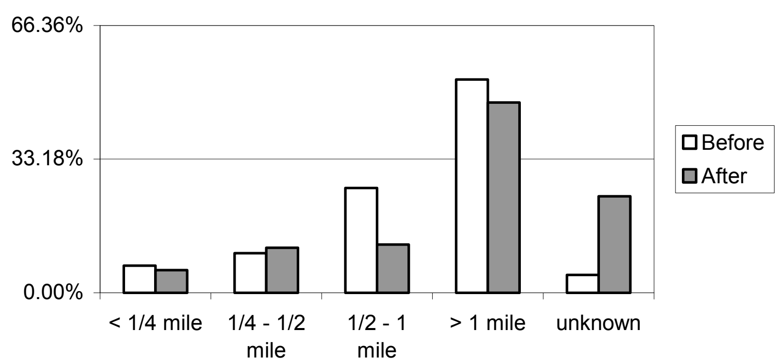



**Table 8. Distances From School, Murrieta Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **< 1/4 mile** | 15 (6.73%) | 7 (5.60%) | -8 (-1.13%) |
| **1/4 - 1/2 mile** | 22 (9.87%) | 14 (11.20%) | -8 (1.33%) |
| **1/2 - 1 mile** | 58 (26.01%) | 15 (12.00%) | -43 (-14.01%) |
| **> 1 mile** | 118 (52.91%) | 59 (47.20%) | -59 (-5.71%) |
| **Missing/other** | 10 (4.48%) | 30 (24.00%) | 20 (19.52%) |

### *Transportation mode splits*

According to survey respondents, the percentage of children who walk or bike to school and who use bus or transit both increased slightly after the construction of the SR2S project (1.02 percent and 5.4 percent, respectively.) These rates, however, remained low overall, with only 6.40 percent walking or bicycling to school and 16.00 percent taking bus or transit (according to after construction survey responses). The majority of children travel to school by private vehicle; these rates declined somewhat, from 81.61 percent (before construction survey) to 73.60 percent (after construction survey.) It appears that this change is due mostly to an increase of children traveling by bus or transit, rather than to significant increases in the percentage of children traveling to school by walking or bicycling.

**Figure 7: Transportation Mode Splits for Commutes to School, Murrieta Elementary School**

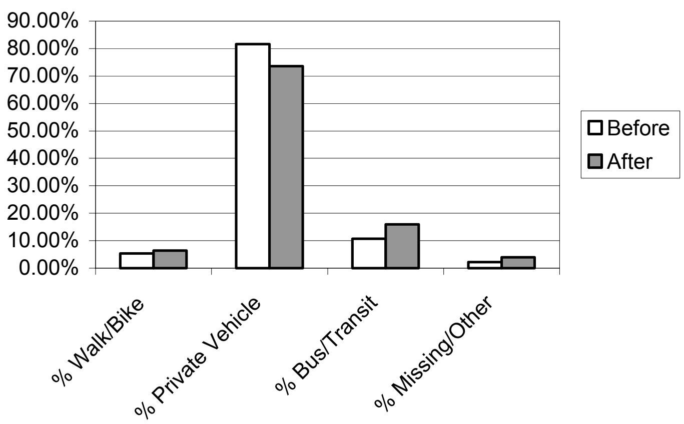



**Table 9: Transportation Mode Splits for Commutes to School, Murrieta Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Walk/Bike** | 5.38% | 6.40% | 1.02% |
| **Private Vehicle** | 81.61% | 73.60% | -8.01% |
| **Bus/Transit** | 10.76% | 16.00% | 5.24% |
| **Missing/Other** | 2.24% | 4.00% | 1.76% |

### *Transportation mode splits by distance from school*

Few respondents lived within quarter mile of school. Of these, however, most children traveled to school by walking (4 of 7 respondents). For all respondents who lived more than quarter from school, private vehicles were the primary mode of travel. The percentage of children traveling to school by private vehicle ranged from 64.29 percent of children who lived quarter to half mile from school, to 84.75 percent of children who lived more than a mile from school. No children who lived more than half mile from school walked or bicycled to school. All children who traveled by bus or transit lived more than half mile from school.

Again, it is significant that the largest group of respondents lived more than a mile away from Murrieta School. If these figures hold for the rest of the Murrieta School population, efforts to increase the percentage of children who walk to school may face serious challenges because of the distance to school that children must travel.

**Figure 8: Transportation Mode Splits for Commutes to School by Distance from School, Murrieta Elementary School**

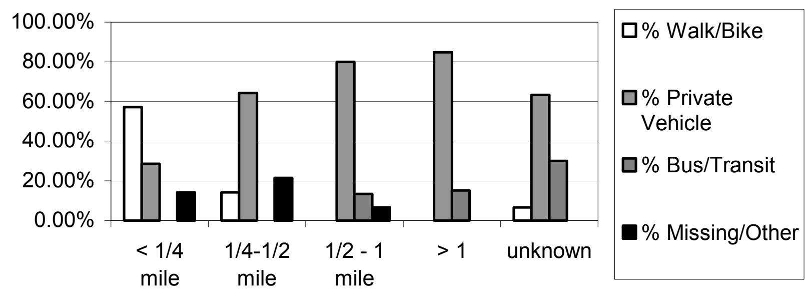



**Table 10: Transportation Mode Splits for Commutes to School by Distance from School, Murrieta Elementary School**

| | < 1/4 mile | 1/4-1/2 mile | 1/2 - 1 mile | > 1 | Unknown |
|---|---|---|---|---|---|
| **Walk/Bike** | 4 (57.14%) | 2 (14.29%) | 0 (0.00%) | 0 (0.00%) | 2 (6.67%) |
| **Private Vehicle** | 2 (28.57%) | 9 (64.29%) | 12 (80.00%) | 50 (84.75%) | 19 (63.33%) |
| **Bus/Transit** | 0 (0.00%) | 0 (0.00%) | 2 (13.33%) | 9 (15.25%) | 9 (30.00%) |
| **Missing/Other** | 1 (14.29%) | 3 (21.43%) | 1 (6.67%) | 0 (0.00%) | 0 (0.00%) |

### *Location of SR2S construction project relative to survey respondents*

The SR2S project did not appear to increase walking disproportionately for those along its route. In fact, respondents for whom the SR2S project would be along their children’s walk to school, more often reported that their children walked less after construction (7.38 percent walked less after construction). Only 4.92 percent of these same respondents reported that their children walked more after construction of the SR2S project.

**Figure 9: Project Along Usual Route vs. Percentage Walked, Murrieta Elementary School**

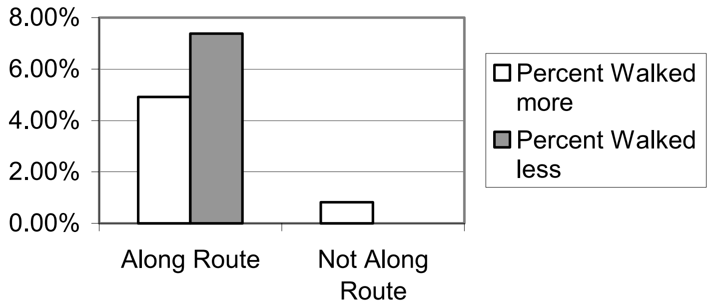



**Table 11. Project Along Usual Route vs. Percentage Walked, Murrieta Elementary School**

| | Along route | Not along route |
|---|---|---|
| **Percent walked more** | 4.92% | 0.82% |
| **Percent walked less** | 7.38% | 0.00% |

### *Parents' perceptions of effects of SR2S construction project*

Though the SR2S construction project did not appear to significantly increase children's walking to Murrieta School, parents positively evaluated the construction project in terms of its other effects, especially those related to safety. Nearly 85 percent of respondents felt that the construction project made walking and/or bicycling safer, 76.00 percent felt that the project made it easier to cross the street, and 57.00 percent felt that the project made drivers more aware of children. Almost half of respondents (49.60 percent) believed that the project slowed car traffic though a substantial percentage of respondents (43.20 percent) did not believe that the project slowed car traffic.

**Figure 10: Perceived Effects of Project, Murrieta Elementary School**

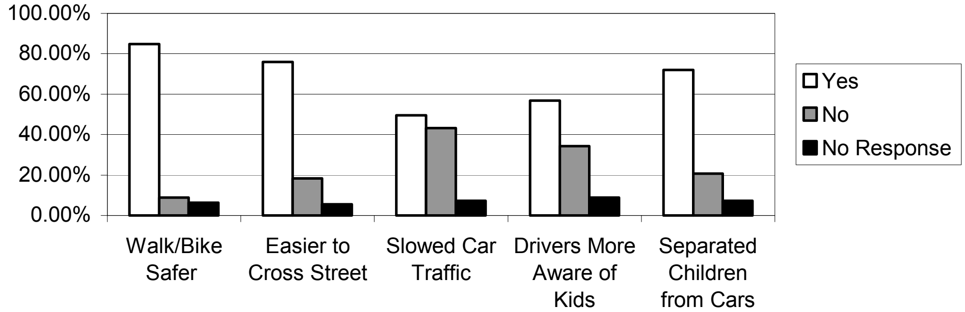



**Table 12: Perceived Effects of Project, Murrieta Elementary School**

| | Yes | No | No Response |
|---|---|---|---|
| **Walk/Bike Safer** | 106 (84.80%) | 11 (8.80%) | 8 (6.40%) |
| **Easier to Cross Street** | 95 (76.00%) | 23 (18.40%) | 7 (5.60%) |
| **Slowed Car Traffic** | 62 (49.60%) | 54 (43.20%) | 9 (7.20%) |
| **Drivers More Aware of Kids** | 71 (56.80%) | 43 (34.40%) | 11 (8.80%) |
| **Separated Children from Cars** | 90 (72.00%) | 26 (20.80%) | 9 (7.20%) |

### *Parents' perceptions of importance of SR2S construction project*

Another indication of the value of the SR2S construction project is its perceived importance to parents and guardians. Survey respondents perceived this construction project as among the most important possible projects to improve child pedestrian safety in the neighborhood near Murrieta Elementary School. Seventy-five percent of respondents characterized this construction project as "important" or as "the most important" project to improve safety for children walking near the school. Another 16.00 percent of respondents characterized the project as "helpful but less important," and only 1.60 percent of respondents classified the project as "not important."

**Figure 11: Perceived Importance of Project, Murrieta Elementary School**

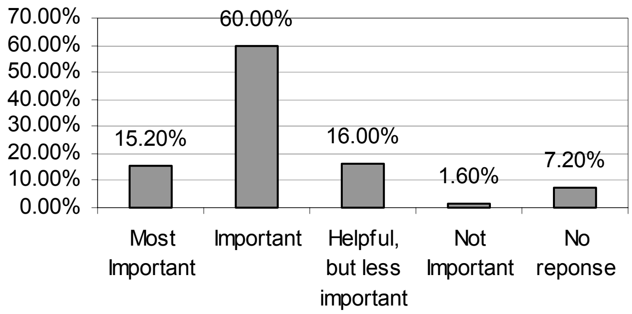



**Table 13: Perceived Importance of Project, Murrieta Elementary School**

| | |
|---|---|
| **Most important** | 19 (15.20%) |
| **Important** | 75 (60.00%) |
| **Helpful, but less important** | 20 (16.00%) |
| **Not important** | 2 (1.60%) |
| **No response** | 9 (7.20%) |

## Sheldon Elementary School

### I. School location and project description

2601 May Road
El Sobrante, CA 94803
Contact: Cynthia Swainbank, Principal
Phone: (510) 223-0500

Grades: K-6
School population: 531
Average class size: 22.2

<u>Ethnic Makeup:</u>
Asian: 11.4%
Hispanic: 22.1%
African American: 26.3%
White: 32.3%
City population: (Richmond, 2001): 101,700
U.S. Census Classification: "Urban fringe of a large city"

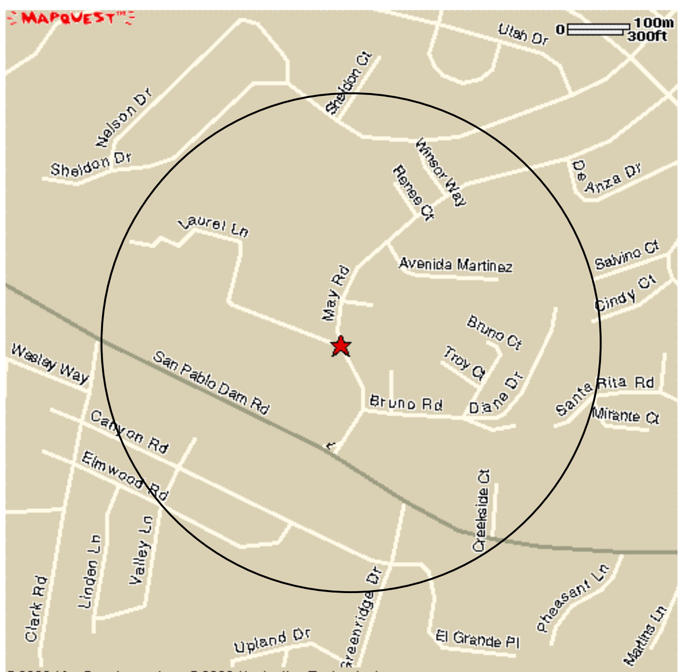
**Dates observed:** 04/18/2002 and 04/19/2002 (before construction); 05/09/2003 and 05/12/2003 (after construction)

**Work Type:** Sidewalk improvements

### *Description of the neighborhood*

The neighborhood surrounding Sheldon Elementary School can be considered fairly traditional suburban. It is an established bedroom community of the San Francisco Bay area, located in an unincorporated area of Contra Costa County. San Pablo Dam Rd is a major arterial, one block from the school that breaks the neighborhood into two distinct areas. One side of the neighborhood is comprised of many small curvilinear roads, many with quite a steep grade. The opposite side has a less steep grade and longer, more rectilinear roads.

The project took place on San Pablo Dam Road between the intersections of Clark Road and Greenridge Drive. Only 100 of the 500 feet between these intersections currently have sidewalks and curbs. The frequent gaps in the sidewalk force pedestrians and cyclists into the shoulder of the road; if there are parked cars in the shoulder, the pedestrians must walk directly on the street. The project filled in the missing segments of sidewalk and curbs along the north and south sides of San Pablo Dam Road. The projected cost of this improvement is $225,153.




Star indicates location of elementary school; Circle represents portion of neighborhood included in the study (approx. ¼ mile radius from the elementary school)


Sheldon Elementary School


San Pablo Dam Road before sidewalk improvement


San Pablo Dam Road after sidewalk improvement


New sidewalk at the San Pablo Dam Road and May Road intersection

### *Neighborhood characteristics*

Based on before-construction observations of the quarter-mile buffer surrounding Sheldon Elementary, this neighborhood has the following urban design characteristics, which are potentially related to pedestrian activity and traffic safety in the area.

**Table 1: Urban Design Characteristics, Sheldon Elementary School**

| | |
|---|---|
| **Urban Design Elements Associated with Perceptions of Traffic Safety** | |
| **Blocks with a complete sidewalk** | 53% |
| **Blocks with a complete buffered, sidewalk** | 10% |
| **Blocks with bike lanes** | 2% |
| **Blocks with bike lanes separated from the street** | 0% |
| **Urban Design Elements Associated with Perceived Crime Safety** | |
| **Blocks with first floor windows visible from the street** | 81% |
| **Blocks with street lighting** | 88% |
| **Blocks where abandoned buildings were absent** | 98% |
| **Blocks where rundown buildings were absent** | 75% |
| **Blocks where vacant lots were absent** | 80% |
| **Blocks where graffiti was absent** | 95% |
| **Blocks where undesirable land uses were absent** | 98% |
| **Urban Design Elements Associated with Traffic Volume, Flow and Speed** | |
| **Average number of traffic lanes within a block** | 2 |
| **Average street width of a block (in ft.)** | 39 |
| **Average block length of a block (in ft.)** | 477 |
| **Average sidewalk width of a block (in ft.)** | 4 |
| **Blocks with traffic circles** | 0% |
| **Blocks with bulbouts** | 0% |
| **Blocks with speed bumps** | 3% |
| **Blocks with cul-de-sacs** | 20% |
| **Blocks with medians** | 12% |
| **Blocks with paving treatments** | 0% |
| **Urban Design Elements Associated with Walkability** | |
| **Blocks with street trees** | 7% |
| **Blocks with mixed uses** | 10% |
| **Blocks with public space** | 0% |
| **Blocks with street furniture** | 0% |

## II. Traffic analysis

Sheldon Elementary School is located on the northwest side of May Road, a two-lane local street. Vehicle and pedestrian data were gathered along San Pablo Dam Road at May Road on April 18 and April 19, 2002 (pre-construction) and May 9 and May 12, 2003 (post-construction). Morning and afternoon observation periods (45-minutes each) commenced at 8:00 a.m. and 2:00 p.m. respectively, and coincide with the peak flows of school traffic.

### *Vehicle counts*

Figure 1 plots the combined volume of east- and west-bound traffic along San Pablo Dam Road for both the morning and afternoon, pre- and post-construction periods. *Off-peak* values represent the total number of vehicles observed over the last 10 minutes of the morning period or the first 10 minutes of the afternoon period. These periods typically coincide most closely with traffic patterns outside of school drop off and pick up times. *Peak* values represent the sum of vehicles counted over the 10-minute period with the greatest traffic volume.

In the *before* construction period, the a.m. off-peak count was 338 cars in the 10 minute period. This value decreased after the construction of the SR2S project, to 238. Likewise, the a.m. peak count was 470 cars before construction, which dropped to 380 after construction of the project. While the afternoon off-peak counts experienced a similar pattern, dropping from 266 to 263, the afternoon peak value actually increased from 306 to 337 after the SR2S project was implemented.

These distributions suggest that a.m. peak traffic volumes were greater than p.m. peak levels, both before and after construction of the SR2S project. Vehicle counts dropped after the construction of the SR2S project for two of the four time periods measured: a.m. off-peak (30 percent) and a.m. peak (19 percent). Vehicle counts were nearly identical during the afternoon off-peak period before and after the construction of the SR2S project, and afternoon peak vehicle counts increased by 10 percent in the post-construction period (Table 2).

**Figure 1: Vehicle Counts, Sheldon Elementary School**

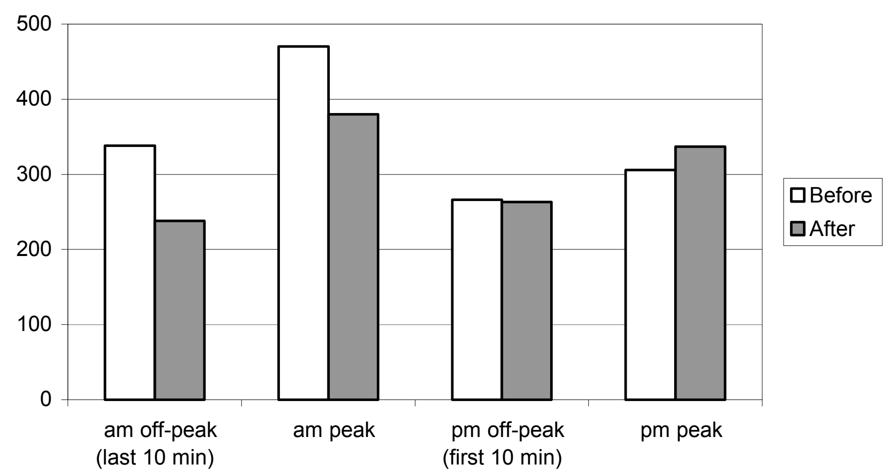



**Table 2: Vehicle Counts, Sheldon Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 338 | 238 | -30% |
| **a.m. peak** | 470 | 380 | -19% |
| **p.m. off-peak** | 266 | 263 | -1% |
| **p.m. peak** | 306 | 337 | 10% |

### *Vehicle speeds*

Like vehicle counts, average vehicle speeds are reported with respect to off-peak values, that is, the average speeds observed over the last ten minutes of the morning period and the first ten minutes of the afternoon period. Off-peak vehicle speeds more closely reflect average velocities for non-drop off and pick-up hours. *Peak period* velocities—the lowest ten-minute mean speeds averaged over the two-day observation period—are also provided for the morning and afternoon, pre- and post-construction periods. The error bars in Figure 2 are based on an assumed human accuracy of +/- 0.3 seconds in both the start and stop time used to calculate speed measurements. The researchers believe this is, if anything, an overestimate of the level of human inaccuracy involved in the speed measurements.

Off-peak speeds on San Pablo Dam Road in the morning observation period marginally increased from 40.43 mph in the pre-construction period to 41.50 mph after construction (an increase of 3 percent). In contrast, the peak a.m. average velocities before and after project construction decreased from 33.69 mph to 33.29 mph (4 percent). Afternoon off-peak speeds decreased from 39.30 mph before construction to 31.96 mph (19 percent) after project construction. The peak p.m. velocities followed a similar trend, decreasing 12 percent from 36.02 mph pre-construction to a post-construction average speed of 31.68 mph (Table 3).

**Figure 2: Average Vehicle Speeds, Sheldon Elementary School**

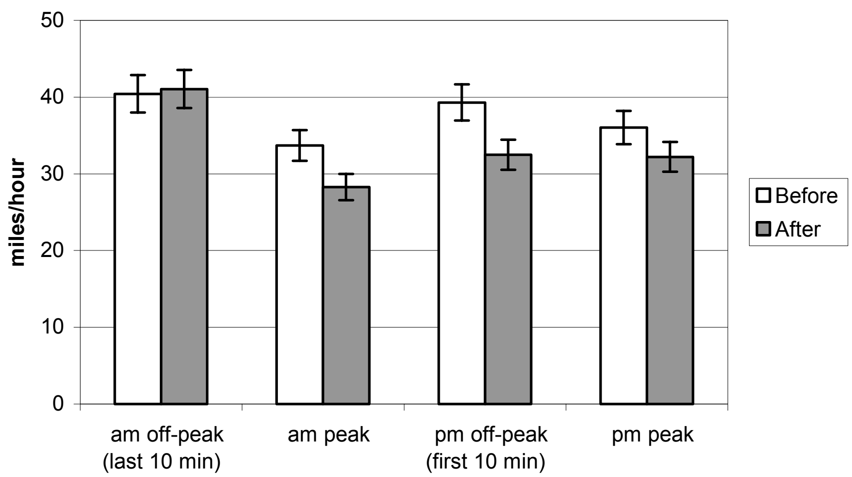



**Table 3: Average Vehicle Speeds, Sheldon Elementary School**

| | Before (mph) | After (mph) | % Change |
|---|---|---|---|
| **a.m. off-peak** | 40.43 | 41.50 | 3% |
| **a.m. peak** | 33.69 | 32.29 | -4% |
| **p.m. off-peak** | 39.30 | 31.96 | -19% |
| **p.m. peak** | 36.02 | 31.68 | -12% |

### *Pedestrian and cyclist counts*

*Baseline* and *peak* count measures are reported for combined pedestrian and cyclist traffic. Figure 3 plots these values for Sheldon Elementary School. The off-peak count increased from 1.0 (pre-construction) to 6.0 (post-construction) in the morning period and decreased from 4.0 (pre-construction) to 1.5 (post-construction) in the afternoon period. The post-construction peak values were higher in both the morning (9.00) and afternoon (29.5) periods compared to the pre-construction values of 6.0 and 25.5 respectively.

Off-peak counts for pedestrians and cyclists were relatively low overall, with most activity clustered in the afternoon. Most notable is that pedestrian and cyclist activity during three of the four observation periods, increased after implementation of the SR2S construction project (Table 4).

**Figure 3: Child Pedestrian and Cyclist Counts, Sheldon Elementary School**

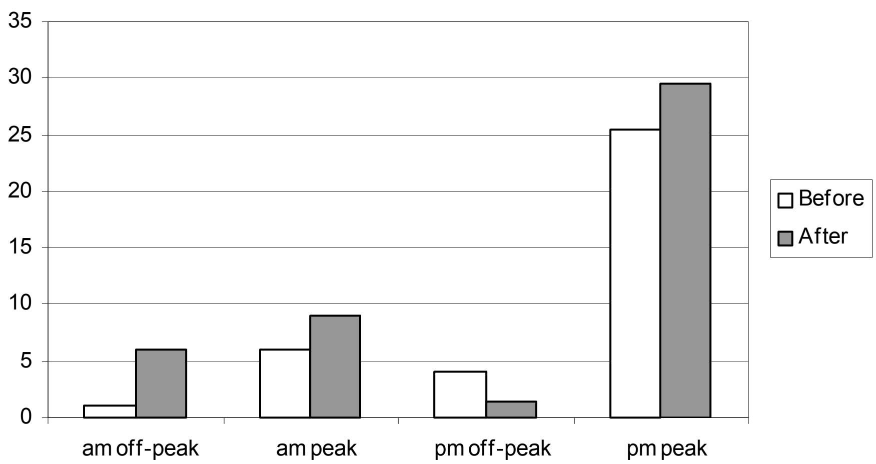



**Table 4: Child Pedestrian and Cyclist Counts, Sheldon Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 1.0 | 6.0 | 500% |
| **a.m. peak** | 6.0 | 9.0 | 50% |
| **p.m. off-peak** | 4.0 | 1.5 | -63% |
| **p.m. peak** | 25.5 | 29.5 | 16% |

### *Locations of pedestrians*

Researchers monitored the locations of pedestrians relative to the sidewalk or street during 45-minute morning and afternoon observation periods. Figure 4 plots the number of pedestrians who used either: (1) a sidewalk and/or path separated from the street; or (2) a street and/or street shoulder.

Table 5 shows that child pedestrians utilized the street as well as the sidewalk to get to and from school. The number of child pedestrians that used only a sidewalk or path increased from 47 to 99 (a 111 percent increase) after sidewalks were installed. Equally promising is that the number of children observed on a street or street shoulder decreased 42 percent after the SR2S project was implemented.

**Figure 4: Child Pedestrian Locations, Sheldon Elementary School**

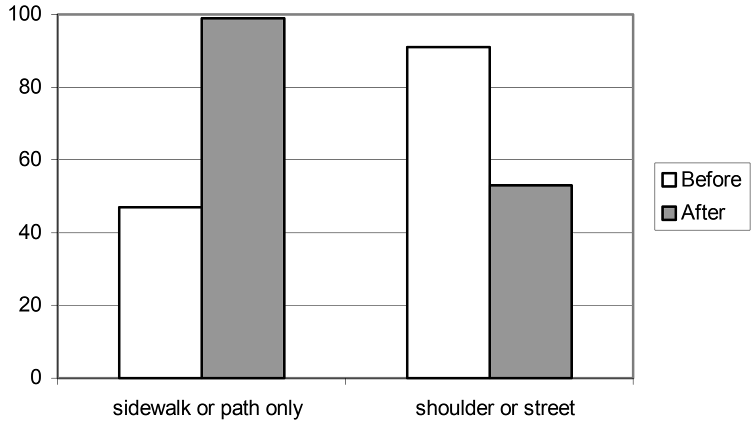



**Table 5: Child Pedestrian Locations, Sheldon Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **Sidewalk or path only** | 47 | 99 | 111% |
| **Shoulder or street** | 91 | 53 | -42% |
| ***Total child pedestrians*** | ***138*** | ***152*** | ***10%*** |

### *Yielding behavior*

The final facet of the traffic analysis was to document whether automobile drivers adequately yield to pedestrians and cyclists. This behavior was indicated with a basic yes or no: the former specifies that the driver obeyed traffic laws, and waited, if obligated, for the pedestrian or cyclist to proceed safely across the intersection, and the latter suggests that the driver encroached on the pedestrian's path, thereby forcing the person to yield to the motorized vehicle. Figure 5 shows that 96 percent of the observed drivers (24 of 25) yielded during the before project construction observation period, while 100 percent of motorists fully yielded to pedestrians and cyclists after construction (Table 6).

**Figure 5: Yielding Behavior, Sheldon Elementary School**

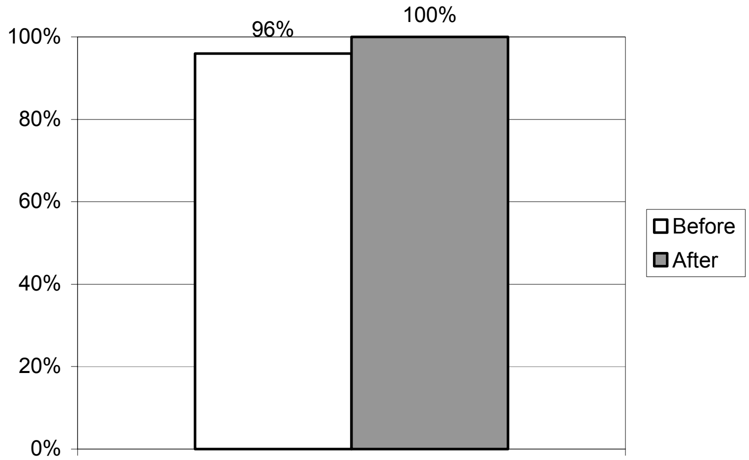



**Table 6: Yielding Behavior, Sheldon Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Yielded** | 24 (96%) | 63 (100%) | 4% |
| **Did not yield** | 1 (4%) | 0 (0%) | -4% |
| ***Total*** | ***25*** | ***63*** | |

## III. Survey results

The final section of this report focuses on parents' responses to take-home surveys that were distributed before and after project construction. The surveys solicited demographic information such as household size, employment status, and household income, as well as numerous transportation-related responses. Parents were asked to identify the transportation mode their child uses for their journey to and from school, their feelings of the SR2S infrastructure project, and whether or not the construction is likely to change their children's travel behavior. A total of 71 pre-construction (35.50 percent) and 80 post-construction (40.82 percent) surveys were completed by parents of Sheldon Elementary School students. A summary of these responses is provided below.

### *Demographic information*

Table 7 summarizes demographic attributes gleaned from the pre- and post-construction survey responses. The investigators wish to emphasize that the before and after values were drawn from two different surveys and two different samples. Therefore, the percentage change of these variables should be interpreted more as a measure of variation between the samples rather than a real change in the population's characteristics.

**Table 7: Demographic Characteristics of Households, Sheldon Elementary School**

| | Before | After | Change |
|---|---|---|---|
| ***Average age of child for whom survey was completed*** | 9.49 | 9.44 | -0.05 |
| ***Sex of child (% female)*** | N/A | N/A | N/A |
| ***Average grade of child*** | 3.88 | 3.73 | -0.15 |
| ***Percentage of population living with spouse or significant other*** | 80.95% | 85.33% | 4.38% |
| ***Average number of persons in house*** | 4.76 | 5.00 | 0.24 |
| ***Average number of persons between 6 and 16 years of age*** | 1.85 | 2.03 | 0.18 |
| ***Average number of licensed drivers in household*** | 2.05 | 2.07 | 0.02 |
| ***Average number of cars in household*** | 2.15 | 2.30 | 0.15 |
| ***Average number of persons working full- or part-time*** | 1.52 | 1.53 | 0.01 |
| ***Average number of persons working 20 hours per week or more*** | 1.38 | 1.05 | -0.33 |
| ***Average number of years parent in school*** | 13.06 | 13.41 | 0.35 |
| ***Annual Household Income*** | | | |
| **$15,000 or less** | 7 (9.86%) | 8 (10.00%) | 1 (0.14%) |
| **$15,001 to $35,000** | 14 (19.72%) | 16 (20.00%) | 2 (0.28%) |
| **$35,001 to $55,000** | 15 (21.13%) | 17 (21.25%) | 2 (0.12%) |
| **$55,001 to $75,000** | 14 (19.72%) | 15 (18.75%) | 1 (-0.97%) |
| **$75,001 or more** | 10 (14.08%) | 10 (12.50%) | 0 (-1.58%) |
| **No response** | 11 (15.49%) | 14 (17.50%) | 3 (2.01%) |
| ***Years living in neighborhood*** | | | |
| **Under 1 year** | 2 (2.82%) | 7 (8.75%) | 5 (5.93%) |
| **1 to 5 years** | 31 (43.66%) | 33 (41.25%) | 2 (-2.41%) |
| **6 to 10 years** | 23 (32.39%) | 16 (20.00%) | -7 (-12.39%) |
| **Over 10 years** | 12 (16.90%) | 13 (16.25%) | 1 (-0.65%) |
| **Whole life** | 1 (1.41%) | 5 (6.25%) | 4 (4.84%) |
| **No response** | 2 (2.82%) | 6 (7.50%) | 4 (4.68%) |
| ***Years living in U.S.*** | | | |
| **Under 1 year** | 0 (0.00%) | 4 (5.00%) | 4 (5.00%) |
| **1 to 5 years** | 5 (7.04%) | 5 (6.25%) | 0 (-0.79%) |
| **6 to 10 years** | 2 (2.82%) | 3 (3.75%) | 1 (0.93%) |
| **Over 10 years** | 26 (36.62%) | 26 (32.50%) | 0 (-4.12%) |
| **Whole life** | 36 (50.70%) | 34 (42.50%) | -2 (-8.2%) |
| **No response** | 2 (2.82%) | 8 (10.00%) | 6 (7.18%) |
| ***Born in U.S. (%)*** | 46.48% | 37.50% | -8.98% |

The demographic characteristics suggest that the average age and grade of the child for whom the survey was completed were 9.44 years and 3.73, respectively. Over 85 percent of the parents reported that they lived with a significant other (i.e. husband/wife or boyfriend/girlfriend), and the average household size was about 5 persons. About 50 percent of the respondents have lived in their present neighborhood for over 5 years and approximately 10 percent have lived in the U.S. 10 years or less.

The students of Sheldon Elementary School come from households with adequate mobility potentials marked by a household average of 2.30 cars and 2.07 licensed drivers. However, approximately 30 percent of these households earn a modest income of $35,000 per annum or less.

### *Distance from School*

Before project construction, 56.34 percent of parents responded that they lived less than one mile away from their child's school (see Figure 6 and Table 8). About 25 percent lived more than 1 mile away and 18.31 percent did not know or did not answer the question. After project construction, the percentage of parents who responded that they lived less than one mile away decreased to 48.75 percent. The percentage of parents responding that they lived more than one mile away also decreased, to 22.50 percent. The percentage of respondents who did not know or who did not respond increased by about 10 percent, to 28.75 percent.

**Figure 6. Distances From School, Sheldon Elementary School**

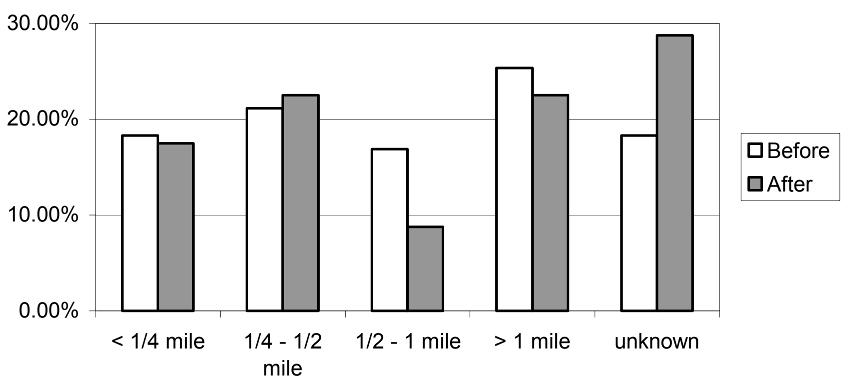



**Table 8. Distances From School, Sheldon Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **< 1/4 mile** | 13 (18.31%) | 14 (17.50%) | 1 (-0.81%) |
| **1/4 mile–1/2 mile** | 15 (21.13%) | 18 (22.50%) | 3 (1.37%) |
| **1/2 mile–1 mile** | 12 (16.90%) | 7 (8.75%) | -5 (-8.15%) |
| **> 1 mile** | 18 (25.35%) | 18 (22.50%) | 0 (-2.85%) |
| **Missing/Other** | 13 (18.31%) | 23 (28.75%) | 10 (10.44%) |

### *Transportation mode splits*

Figure 7 charts the share of each transportation mode utilized for the children's commutes to school. From the figure, it can be discerned that the private vehicle is by far the dominant mode of transport. In fact, 84.51 percent of the children represented in the survey were driven to school in a private automobile in the pre-construction period and 90.00 percent in the post-construction period. Bus and transit represented only a small share of pre- and post-construction commutes (0.00 percent and 1.25 percent, respectively) and the combined share of those who walked or bicycled amounted to 11.27 percent in the pre-construction period. Surprisingly, the combined number of those who bicycled or walked actually fell from 8 to 4 (a 6.27 percent decrease) after the sidewalks were installed (Table 9).

**Figure 7: Transportation Mode Splits for Commutes to School, Sheldon Elementary School**

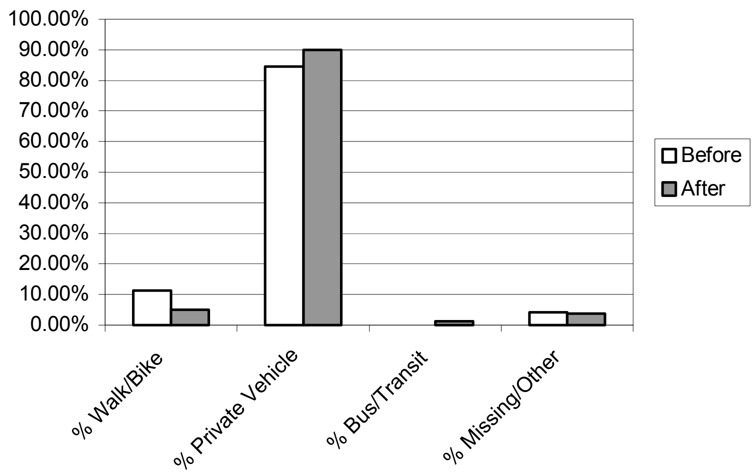



**Table 9: Transportation Mode Splits for Commutes to School, Sheldon Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Walk/bike** | 8 (11.27%) | 4 (5.00%) | -4 (-6.27%) |
| **Private vehicle** | 60 (84.51%) | 72 (90.00%) | 12 (5.49%) |
| **Bus/transit** | 0 (0.00%) | 1 (1.25%) | 1 (1.25%) |
| **Missing/other** | 3 (4.23%) | 3 (3.75%) | 0 (-0.48%) |

### *Transportation mode splits by distance from school*

A cross-tabulation of transportation mode by distance from school suggests that location is associated with the likelihood that a child walks or bicycles to school (Figure 8). For example, three of the four children who walked to Sheldon Elementary after the project was constructed, lived within a quarter-mile of the school's campus. The share of students that commuted by private vehicle was also lower for families living within a quarter-mile of school (78.57 percent). In contrast, of those living between a quarter-mile and half-mile from school, 94.44 percent commuted by private vehicle. The private vehicle share was 85.71 percent for children living between a half-mile and 1 mile from school and 94.44 percent of the children living over 1 mile from campus (Table 10).

**Figure 8: Transportation Mode Splits for Commutes to School by Distance from School , Sheldon Elementary School**

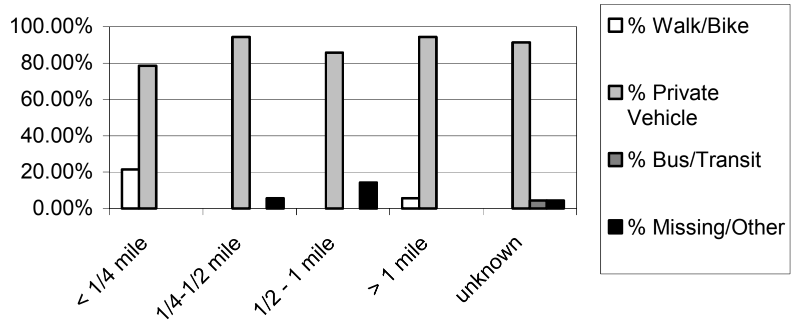



**Table 10: Transportation Mode Splits for Commutes to School by Distance from School , Sheldon Elementary School**

| | < 1/4 mile | 1/4-1/2 mile | 1/2 - 1 mile | > 1 mile | unknown |
|---|---|---|---|---|---|
| **Walk/bike** | 3 (21.43%) | 0 (0.00%) | 0 (0.00%) | 1 (5.56%) | 0 (0.00%) |
| **Private vehicle** | 11 (78.57%) | 17 (94.44%) | 6 (85.71%) | 17 (94.44%) | 21 (91.3%) |
| **Bus/transit** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 1 (4.35%) |
| **Missing/other** | 0 (0.00%) | 1 (5.56%) | 1 (14.29%) | 0 (0.00%) | 1 (4.35%) |

## *Location of SR2S construction project relative to survey respondents*

The location of the SR2S construction project may influence the frequency that children walk to school. For example, survey results indicate that 5 children walked to school more often after the SR2S project was implemented. The project coincided with all 5 of these children's usual route to school. This suggests that these individuals benefited most from the project because it was constructed along their usual route. However, survey results also reveal a net loss of 25 schoolchildren who walk less to school after project construction (Figure 9 and Table 11).

**Figure 9: Project Along Usual Route vs. Percentage Walked, Sheldon Elementary School**

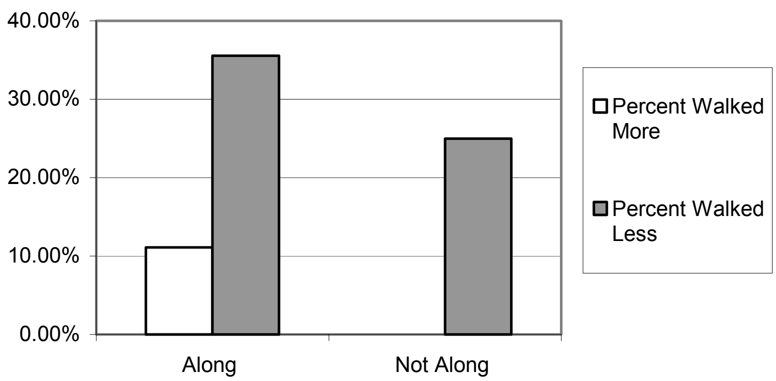


**Table 11: Project Along Usual Route vs. Percentage Walked, Sheldon Elementary School**

| | Along Route | Not Along Route |
|---|---|---|
| **Percent walked more** | 5 (11.11%) | 0 (0.00%) |
| **Percent walked less** | 16 (35.56%) | 8 (25.00%) |

### *Parents' perceptions of effects of SR2S construction project*

The Sheldon after-construction survey also collected information concerning the parents' perceptions of the project's effects. A majority of parents feel that the project produced favorable results such as slowing traffic (47.50 percent), easing street crossings (71.25 percent), separating children from cars (75.00 percent), and making motorists more aware of children along the road (57.50 percent). In general, 83.75 percent of the surveyed parents feel the project enhances safety for child pedestrians and bicyclists (Figure 10 and Table 12).

**Figure 10: Perceived Effects of Project, Sheldon Elementary School**

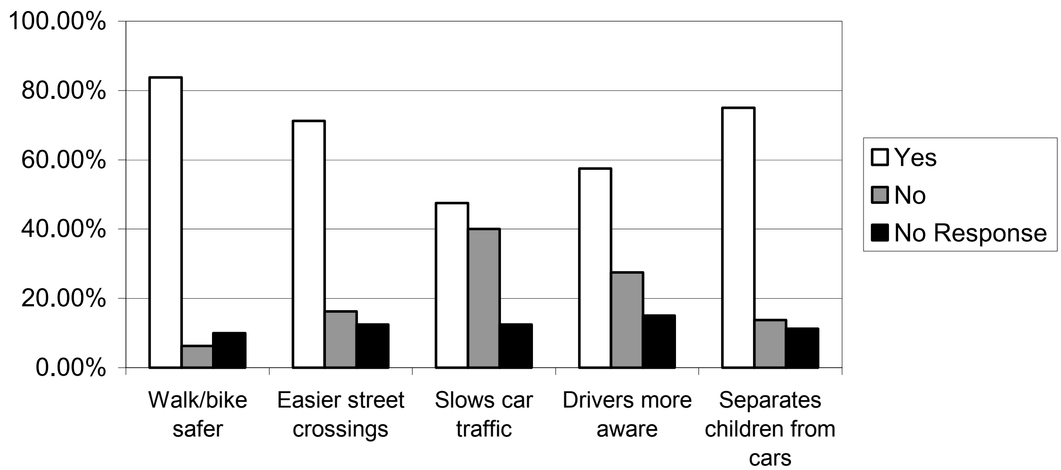



**Table 12: Perceived Effects of Project, Sheldon Elementary School**

| | Yes | No | No Response |
|---|---|---|---|
| **Walk/bike safer** | 67(83.75%) | 5 (6.25%) | 8 (10.00%) |
| **Easier to cross street** | 57 (71.25%) | 13 (16.25%) | 10 (12.50%) |
| **Slows car traffic** | 38 (47.50%) | 32 (40.00%) | 10 (12.50%) |
| **Drivers more aware of children** | 46 (57.50%) | 22 (27.50%) | 12 (15.00%) |
| **Separates children from cars** | 60 (75.00%) | 11 (13.75%) | 9 (11.25%) |

### *Parents' perceptions of importance of SR2S construction project*

The final part of this section briefly outlines the parents' perceptions of the importance of the SR2S project. Figure 10 shows that 33.75 percent of the respondents feel the project is the single most important construction project that could have been built while 43.75 percent believe that it was among the few most important construction projects that could have been built. Only two of the 71 parents that responded to this question (2.81 percent) felt that the project was not at all important (Figure 11 and Table 13).

**Figure 11: Perceived Importance of Project, Sheldon Elementary School**

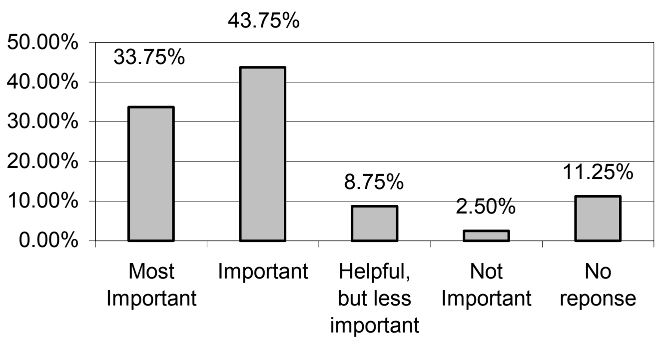



**Table 13: Perceived Importance of Project, Sheldon Elementary School**

| | |
|---|---|
| **Most Important** | 27 (33.75%) |
| **Important** | 35 (43.75%) |
| **Helpful, but less important** | 7 (8.75%) |
| **Not Important** | 2 (2.5%) |
| **No response** | 9 (11.25%) |

## Valley Elementary School

### I. School location and project description

12333 Eighth St.
Yucaipa, CA 92399
Contact: Pam Whitehurst, Principal
Phone: (909) 797-1125

Grades: K-5
School Population: 764
Average class size: 18.4

<u>Ethnic Makeup:</u>
Asian: 0.1%
Hispanic: 24.1%
African American: 1.8%
White: 71.6%
City population (Yucaipa): 42,250
U.S. Census Classification: "Urban fringe of a large city"

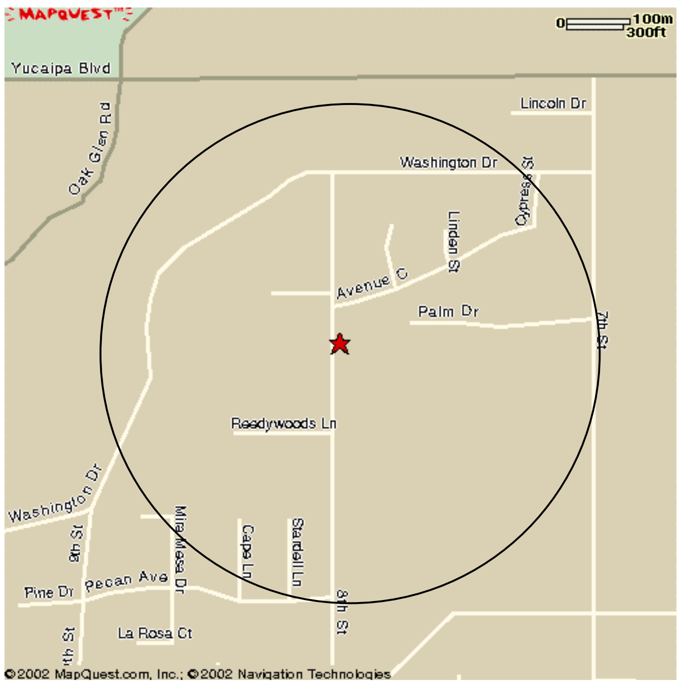
**Date observed:** 07/24/02 and 07/25/02 (before construction); 04/14/03 and 04/16/03 (after construction)

**Project type:** Sidewalk improvements, pedestrian crossing improvements

### *Description of the neighborhood*

This neighborhood is located in Yucaipa, a bedroom community of the City of San Bernardino. The neighborhood, and especially the surrounding area, is experiencing growth that appears to be changing the once rural nature of this neighborhood to a more suburban character. The neighborhood is comprised of residential land uses on fairly large lots.

The construction project links existing sidewalk at five separate points along both Avenue "E" and 8th Street. Over 3000 feet of sidewalk, curb, gutter and drainage were installed, as well a curb ramp, a crosswalk and four crosswalk signs. The project was proposed to cost $312,140.




Star indicates location of elementary school; Circle represents portion of neighborhood included in the study (approx. 1/4 mile radius from the elementary school)

Valley Yucaipa Elementary School


Neighborhood proximate to Valley Yucaipa Elementary School

Sidewalk improvement along E Street

View of sidewalk improvement along 8th Street

### *Neighborhood Characteristics*

Based on before-construction observations of the quarter-mile area surrounding Valley Elementary School, this neighborhood has the following urban design characteristics, which are potentially related to pedestrian activity and traffic safety in the area.

**Table 1: Urban Design Characteristics, Valley Elementary School**

| | |
|---|---|
| ***Urban Design Elements Associated with Perceptions of Traffic Safety*** | |
| **Blocks with a complete sidewalk** | 22% |
| **Blocks with a complete buffered, sidewalk** | 0% |
| **Blocks with bike lanes** | 2% |
| **Blocks with bike lanes separated from the street** | 0% |
| **Urban Design Elements Associated with Perceived Crime Safety** | |
| **Blocks with first floor windows visible from the street** | 94% |
| **Blocks with street lighting** | 50% |
| **Blocks where abandoned buildings were absent** | 100% |
| **Blocks where rundown buildings were absent** | 100% |
| **Blocks where vacant lots were absent** | 83% |
| **Blocks where graffiti was absent** | 100% |
| **Blocks where undesirable land uses were absent** | 94% |
| **Urban Design Elements Associated with Traffic Volume, Flow and Speed** | |
| **Average number of traffic lanes within a block** | 2 |
| **Average street width of a block (in ft.)** | 37 |
| **Average block length of a block (in ft.)** | 526 |
| **Average sidewalk width of a block (in ft.)** | 6 |
| **Blocks with traffic circles** | 0% |
| **Blocks with bulbouts** | 0% |
| **Blocks with speed bumps** | 0% |
| **Blocks with cul-de-sacs** | 39% |
| **Blocks with medians** | 3% |
| **Blocks with paving treatments** | 0% |
| ***Urban Design Elements Associated with Walkability*** | |
| **Blocks with street trees** | 0% |
| **Blocks with mixed uses** | 0% |
| **Blocks with public space** | 0% |
| **Blocks with street furniture** | 0% |

## II. Traffic analysis

Valley Elementary School is located on 8th Street opposite Reedywoods Lane in the City of Yucaipa. Morning and afternoon observation periods (45-minute each) commenced at 8:15 a.m. and 3:00 p.m., respectively, which coincide with the peak flows of school traffic. Vehicle and pedestrian data were gathered along 8th Street and Reedywoods Lane on July 24 and July 25, 2002 (pre-construction), and on April 14 and April 16, 2003 (post-construction).

### *Vehicle counts*

Figure 1 plots the combined volume of traffic along 8th Street for the morning and afternoon, pre- and post-construction periods. *Off-peak* values represent the total number of vehicles observed over the last ten minutes of the morning period or the first ten minutes of the afternoon period (these periods typically coincide most closely with traffic patterns outside of school drop off and pick up times). *Peak* values represent the sum of vehicles counted over the ten-minute period with the greatest traffic volume.

Before construction of the SR2S project, morning off-peak values included 16 vehicles. Morning peak values included 96 vehicles. Pre-construction afternoon off-peak values included 44.5 vehicles and afternoon peak values included 106 vehicles. After construction, morning off-peak values increased to 24 vehicles, and morning peak values held steady, at 97 vehicles. Afternoon off-peak values declined to 36 vehicles, and afternoon peak values increased to 117 vehicles.

These findings reveal no consistent change in vehicle counts before and after construction of the SR2S improvements. This finding is not surprising, given that this particular SR2S project (sidewalk improvements and pedestrian crossing improvement) should have had no obvious impact on the number of vehicles near Valley Elementary School. There were no other traffic improvements in the area that would be expected to influence traffic at the school (Table 2).

**Figure 1: Vehicle Counts, Valley Elementary School**

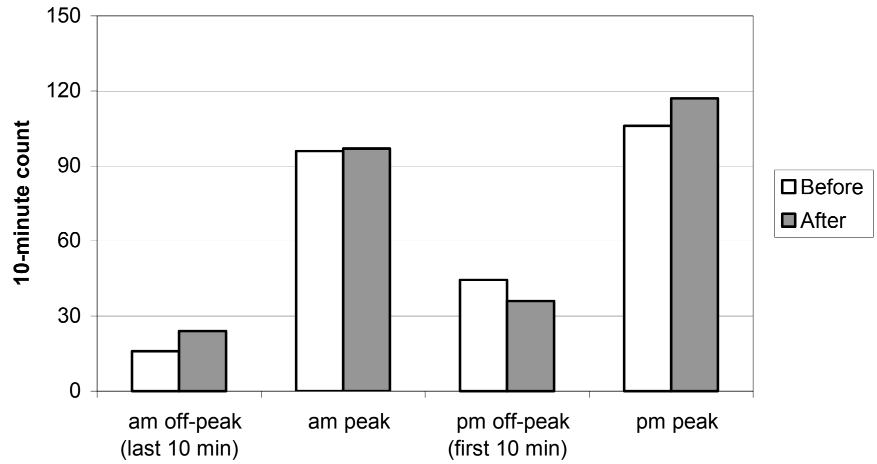



**Table 2: Vehicle Counts, Valley Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **am off-peak** | 16.0 | 24.0 | 50.0% |
| **am peak** | 96.0 | 97.0 | 1.0% |
| **pm off-peak** | 44.5 | 36.0 | -19.1% |
| **pm peak** | 106.0 | 117.0 | 10.4% |

### *Vehicle speeds*

Like vehicle counts, average vehicle speeds are reported with respect to off-peak values, that is, the average speeds observed over the last ten minutes of the morning period and the first ten minutes of the afternoon period, when vehicle speeds are typically closest to those for non-drop off and pick-up hours. *Peak* speed is the average speed for the slowest 10-minute interval. These are also provided for the morning and afternoon, pre- and post-construction phases. The error bars in Figure 2 are based on an assumed human accuracy of +/- 0.3 seconds in the measurement of travel time used to calculate vehicle speed. The researchers believe this is, if anything, an overestimate of the level of human inaccuracy involved in the speed measurements.

Before construction, morning off-peak vehicle speeds averaged 31.1 mph; morning peak vehicle speeds averaged 24.1 mph. Pre-construction afternoon off-peak vehicle speeds averaged 26.8 mph, and afternoon peak vehicle speeds averaged 14 mph. After construction, morning off-peak vehicle speeds increased to 33.1 mph, and morning peak vehicle speeds increased to 26.8 mph. Only one day of post-construction speeds were collected in the afternoon. Those data did not include data for speeds in the (slower) less congested direction, resulting in higher average post construction speeds. Data on speed are therefore highly deceptive.

The construction of sidewalk improvements should have had no obvious impact on vehicle speeds. The construction of a pedestrian crosswalk and crosswalk signage might ideally have had the effect of slowing vehicle traffic in this area (Table 3).

**Figure 2: Average Vehicle Speeds, Valley Elementary School**

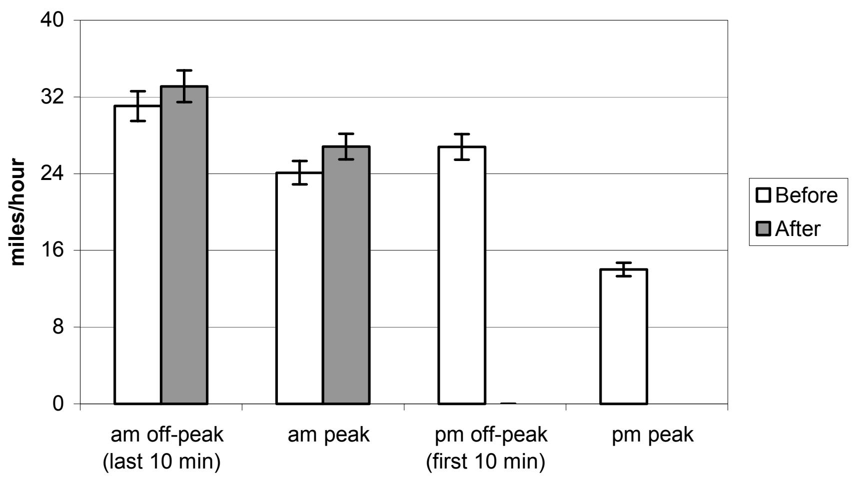



**Table 3: Average Vehicle Speeds, Valley Elementary School**

| | Before (mph) | After (mph) | % Change |
|---|---|---|---|
| **am off-peak** | 31.05 | 33.11 | 6.4% |
| **am peak** | 24.10 | 26.83 | 11% |
| **pm off-peak** | 26.79 | N/A | N/A |
| **pm peak** | 14.00 | N/A | N/A |

### *Pedestrian and cyclist counts*

*Baseline* and *peak* count measures are reported for pedestrian and cyclist traffic. Figure 3 plots these values for Valley Elementary School.

Child walking and bicycling near Valley School are low both before and after construction of the SR2S project for three of the four prescribed time periods. Before and after construction, morning off-peak values of child pedestrian and cyclists are 0.0, and 8.5 and 8.0, respectively. Before construction, afternoon off-peak values include 3 child pedestrians or cyclists. After construction, this value increases to 10.0 child pedestrians or cyclists. The afternoon sees considerably more children walking or bicycling near school. Before construction, afternoon off-peak peak values include 34.0 child pedestrians or cyclists. After construction, this number increases to 56.0. It appears, based on these figures, that more children walk or bicycle after than before school, and that the SR2S construction projects may be associated with increased afternoon walking or bicycling (Table 4).

**Figure 3: Child Pedestrian and Cyclist Counts, Valley Elementary School**

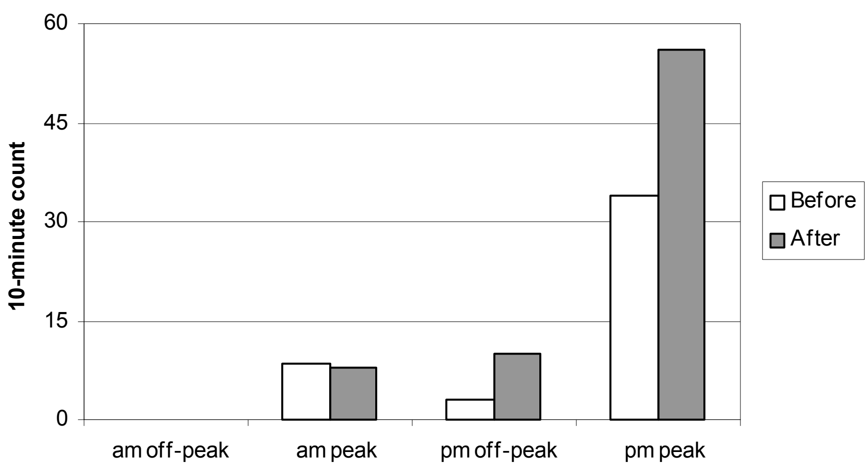



**Table 4: Child Pedestrian and Cyclist Counts, Valley Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **am off-peak** | 0.0 | 0.0 | 7% |
| **am peak** | 8.5 | 8.0 | 11% |
| **pm off-peak** | 3.0 | 10.0 | 19% |
| **pm peak** | 34.0 | 56.0 | 78% |

### *Location of pedestrians*

The location of walking activity (relative to the sidewalk or street) was observed during the 45-minute morning and afternoon observation periods. Figure 4 reports the number of pedestrians who were observed on: (1) sidewalks (paved surfaces separated from the street) and paths (non-paved surfaces separated from the street); (2) street shoulders and directly on streets. Note that pedestrians were counted multiple times if they utilized more than one type of walkway.

The total number of child pedestrians observed remains fairly constant before and after construction of the SR2S project, at 95 and 89, respectively. Findings reveal a large increase in the number of children walking on sidewalks or paths after construction (55 percent) as compared with a decrease in the percentage of child pedestrians using shoulders or streets (-90 percent). This finding is significant, in that the objective of this construction project – adding sidewalks, among other improvements – was specifically intended to decrease the number of children walking on streets or street shoulders (Table 5).

**Figure 4: Locations of child pedestrians and cyclists, Valley Elementary School**

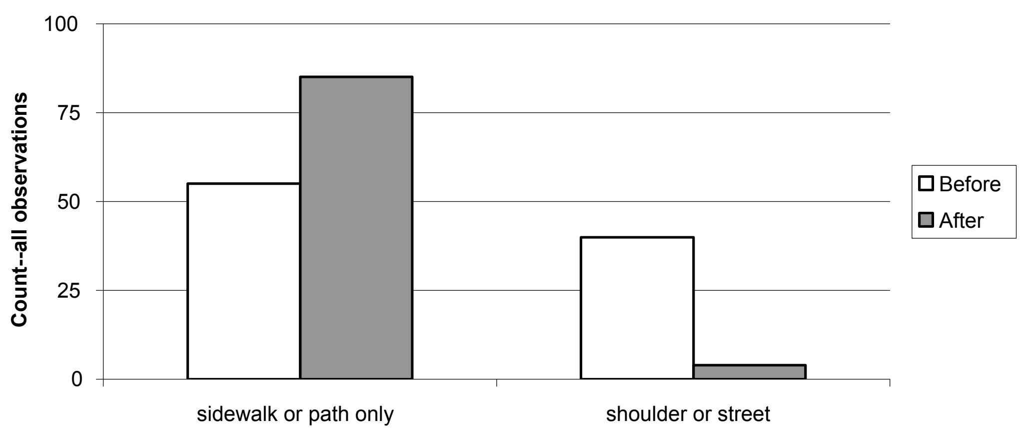



**Table 5: Locations of child pedestrians, Valley Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **Sidewalk or path only** | 55 | 85 | 55% |
| **Shoulder or street** | 40 | 4 | -90% |
| ***Total child pedestrians*** | 95 | 89 | -6% |

### *Yielding behavior*

The final facet of the traffic analysis was to document whether automobile drivers adequately yielded to pedestrians and cyclists. This behavior was indicated with a simple yes or no: the former specifies that the driver obeyed traffic laws, and waited, if obligated, for the pedestrian or cyclist to proceed safely across the intersection. The latter suggests that the driver encroached on another's path when he or she was legally obligated to yield.

Opportunities for yielding at the observed site near Valley Elementary School were somewhat limited, with a total of 19 possible yielding opportunities before construction and 12 possible yielding opportunities after construction of the SR2S project. Appropriate yielding occurred in most instances, both before and after construction, at the rate of 95 percent and 100 percent, respectively. A total of only one instance of failure to yield was observed.

**Figure 5: Yielding Behavior, Valley Elementary School**

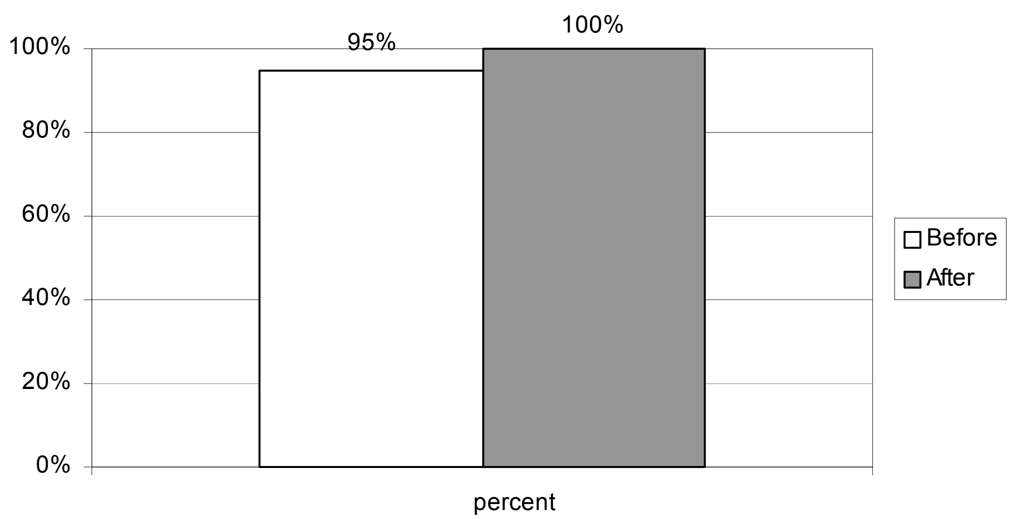



**Table 6: Yielding Behavior, Valley Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Yielded** | 18 (95%) | 12 (100%) | |
| **Did not yield** | 1 | 0 | |
| **Total** | ***19*** | ***12*** | |

## III. Survey results

This section of the analysis examines parents' responses to take-home surveys that were distributed before and after project construction. The surveys solicited demographic information such as household size, employment status, and household income, as well as numerous transportation-related responses. Parents were asked to identify the transportation modes their children use for their journeys to and from school, parents' assessment of the SR2S construction project, and whether or not the construction project was likely to change their children's travel behavior. A total of 157 pre-construction surveys (42.90% response rate) and 125 post-construction surveys (32.55% response rate) were completed by parents of Valley Elementary School students. A summary of these responses is provided below.

### *Demographic information*

Table 7 summarizes demographic attributes gleaned from the pre- and post-construction survey responses. The investigators wish to emphasize that the before and after values were drawn from two different surveys and two different samples. Therefore, the percentage change of these variables should be interpreted more as a measure of variation between the samples rather than a real change in the population's characteristics.

**Table 7: Demographic Characteristics of Households, Valley Elementary School.**

| | Before | After | Change |
|---|---|---|---|
| ***Average age of child for whom survey was completed*** | 9.03 | 9.55 | 0.52 |
| ***Sex of child (% female)*** | 48.41 | 56.00 | 0.08 |
| ***Average grade of child*** | 4.12 | 3.81 | -0.31 |
| ***Percentage of population living with spouse or significant other*** | 80.89% | 80.80% | -0.09% |
| ***Average number of persons in household*** | 4.60 | 4.81 | 0.21 |
| ***Average number of persons between 6 and 16 years of age*** | 2.04 | 2.13 | 0.09 |
| ***Average number of licensed drivers in household*** | 1.93 | 1.98 | 0.05 |
| ***Average number of cars in household*** | 2.09 | 2.19 | 0.10 |
| ***Average number of persons working full- or part-time*** | 1.62 | 1.61 | -0.01 |
| ***Average number of persons working 20 hours per week or more*** | 1.54 | 1.59 | 0.05 |
| ***Average number of years parent in school*** | 12.55 | 12.41 | -0.14 |
| **Annual Household Income** | | | |
| **$15,000 or less** | 19 (12.10%) | 13 (10.40%) | -6 (-1.70%) |
| **$15,001 to $35,000** | 42 (26.75%) | 34 (27.20%) | -8 (0.45%) |
| **$35,001 to $55,000** | 28 (17.83%) | 18 (14.40%) | -10 (-3.43%) |
| **$55,001 to $75,000** | 32 (20.38%) | 27 (21.60%) | -5 (1.22%) |
| **$75,001 or more** | 21 (13.38%) | 19 (15.20%) | -2 (1.82%) |
| **No response** | 15 (9.55%) | 14 (11.20%) | -1 (1.65%) |
| **Years living in neighborhood** | | | |
| **Under 1 year** | 10 (6.37%) | 21 (16.80%) | 11 (10.43%) |
| **1 to 5 years** | 82 (52.23%) | 50 (40.00%) | -32 (-12.23%) |
| **6 to 10 years** | 30 (19.11%) | 25 (20.00%) | -5 (0.89%) |
| **Over 10 years** | 30 (19.11%) | 23 (18.40%) | -7 (-0.71%) |
| **Whole life** | 2 (1.27%) | 2 (1.60%) | 0 (0.33%) |
| **No response** | 3 (1.91%) | 4 (3.20%) | 1 (1.29%) |
| **Years living in U.S.** | | | |
| **Under 1 year** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **1 to 5 years** | 1 (0.64%) | 3 (2.40%) | 2 (1.76%) |
| **6 to 10 years** | 4 (2.55%) | 1 (0.80%) | -3 (-1.75%) |
| **Over 10 years** | 25 (15.92%) | 20 (16.00%) | -5 (0.08%) |
| **Whole life** | 122 (77.71%) | 98 (78.40%) | -24 (0.69%) |
| **No response** | 5 (3.18%) | 3 (2.40%) | -2 (-0.78%) |
| ***Born in U.S. (%)*** | 78.34% | 76.80% | -1.54% |

Respondents for Valley school had typically completed high school (slightly over 12 years of school, on average), and lived with their spouse or significant other (over 80% of respondents) in a household with more than 4.6 people (total). Most respondents had more than 2 cars in their households, and most had been born in the US (over 76% of respondents) or had lived in the US for over 10 years (more than 93% of respondents).

Overall, the sample for the after construction survey referenced slightly older children (9.7 years vs. 9 years) and a slightly higher percentage of female children (56% female, vs. 48% female), compared to the sample for the before construction survey. Respondents for the after construction survey were also somewhat more likely to have lived in the neighborhood for less than one year (16.8% vs. 6.4%) than were respondents for the before construction survey.

### *Distance from School*

Approximately 24 percent of respondents lived half-mile or less from Valley Elementary School—considered to be a feasible distance for children to walk to school. More than 40 percent of respondents lived over 1 mile away from school, which would be a significant impediment for walking to school for children in these households.

**Figure 6. Distances From School, Valley Elementary School**

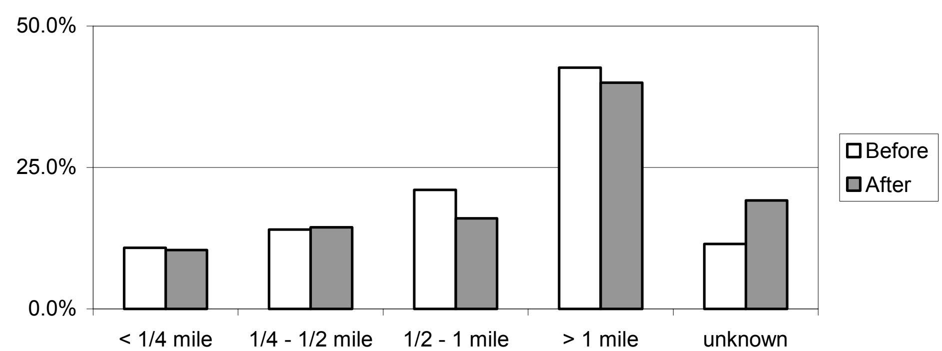



**Table 8. Distances From School, Valley Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **< 1/4 mile** | 17 (10.83%) | 13 (10.40%) | -4 (-0.43%) |
| **1/4 – 1/2 mile** | 22 (14.01%) | 18 (14.40%) | -4 (0.39%) |
| **1/2 – 1 mile** | 33 (21.02%) | 20 (16.00%) | -13 (-5.02%) |
| **> 1 mile** | 67 (42.68%) | 50 (40.00%) | -17 (-2.68%) |
| **Missing/other** | 18 (11.46%) | 24 (19.20%) | 6 (7.74%) |

### *Transportation mode splits*

Most children travel to Valley School via private automobile, at the rate of 58.60 percent (before construction) and 66.40 percent (after construction). (Note also that after construction survey sample included households with more cars and more drivers, compared to before construction survey sample.) A minority of children traveled to school by walking or bicycling, at the rate of 8.28 percent (before construction) and 6.40 percent (after construction). A significant portion of children traveled to school via bus or transit, at over 25.60 percent.

From mode split data alone, it does not appear that the SR2S construction project was associated with an increase in the number of children traveling to school via walking or bicycling (Figure 7 and Table 9).

**Figure 7: Transportation Mode Splits for Commutes to School, Valley Elementary School**

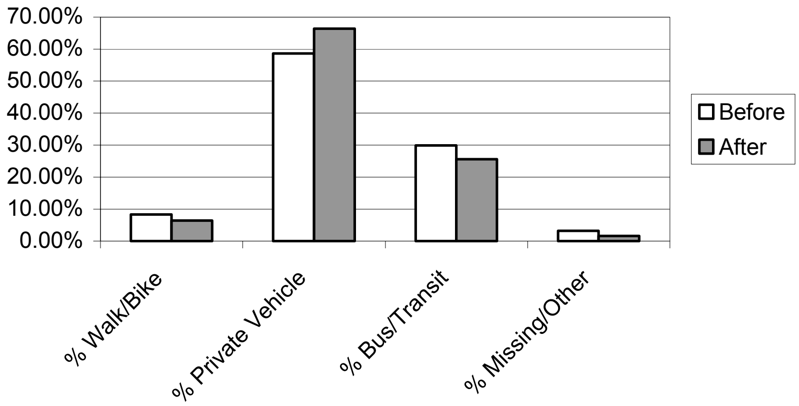



**Table 9: Transportation Mode Splits for Commutes to School, Valley Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Walk/Bike** | 8.28% | 6.40% | -1.88% |
| **Private Vehicle** | 58.60% | 66.40% | 7.80% |
| **Bus/Transit** | 29.94% | 25.60% | -4.34% |
| **Missing/Other** | 3.18% | 1.60% | -1.58% |

### *Transportation mode splits by distance from school*

Few children (total of 7) walked or bicycled as a primary mode of transportation to school. Of these, 3 children lived within a quarter-mile of school. The majority of children traveled to school by private vehicle, ranging from 69.23 percent of those living within a quarter mile, to 59.18 percent of those living more than a mile from school. Of those children traveling to school by bus or transit, most (19 of a total of 25 bus or transit riders) lived more than a mile from school.

**Figure 8: Transportation Mode Splits for Commutes to School by Distance from School, Valley Elementary School**

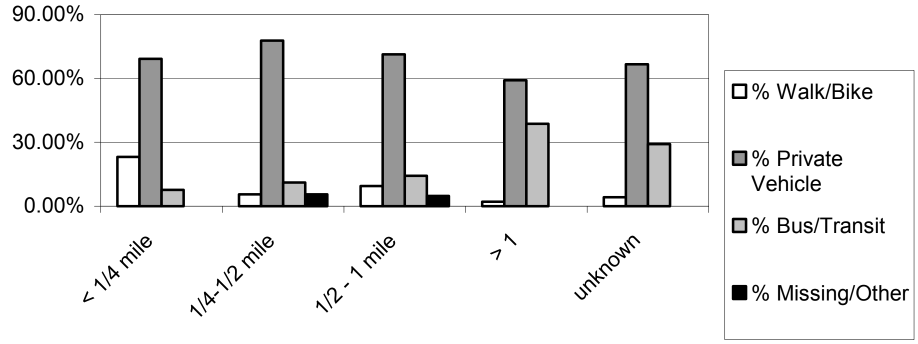



**Table 10: Transportation Mode Splits for Commutes to School by Distance from School, Valley Elementary School**

| | < 1/4 mile | 1/4-1/2 mile | 1/2 - 1 mile | > 1 | unknown |
|---|---|---|---|---|---|
| **Walk/Bike** | 3 (23.08%) | 1 (5.56%) | 2 (9.52%) | 1 (2.04%) | 1 (4.17%) |
| **Private Vehicle** | 9 (69.23%) | 14 (77.78%) | 15 (71.43%) | 29 (59.18%) | 16 (66.67%) |
| **Bus/Transit** | 1 (7.69%) | 2 (11.11%) | 3 (14.29%) | 19 (38.78%) | 7 (29.17%) |
| **Missing/Other** | 0 (0.00%) | 1 (5.56%) | 1 (4.76%) | 0 (0.00%) | 0 (0.00%) |

### *Location of SR2S construction project relative to survey respondents*

The location of the SR2S construction project, and specifically whether the project was along the route children would take to school, did not appear to increase the rate of children's walking to school. In fact, of those children for whom the SR2S project fell along their route to school, 8 children (6.61 percent) walked more after construction, and 8 children (6.61 percent) walked less, according to respondents' reports. In comparison, among those whose route to school did not pass the SR2S construction project, 4 children (3.31 percent) walked less after construction and none walked more. These findings do not identify a clear impact of the SR2S project on walking to school, among those whose walk to school includes the project.

**Figure 9: Project Along Usual Route vs. Percentage Walked, Valley Elementary School**

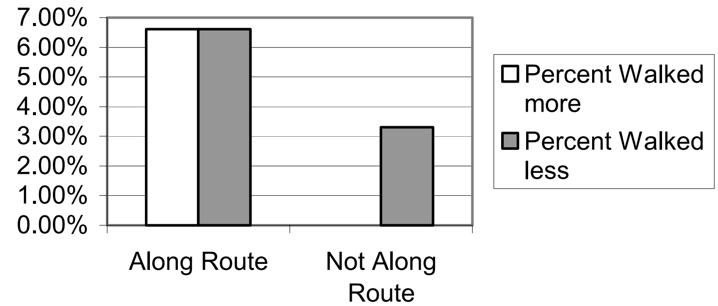



**Table 11. Project Along Usual Route vs. Percentage Walked, Valley Elementary School**

| | Along route | Not along route |
|---|---|---|
| **Percent walked more** | 6.61% | 0.00% |
| **Percent walked less** | 6.61% | 3.31% |

### *Parents' perceptions of effects of SR2S construction project*

Parents and guardians evaluated the SR2S construction project as having a clear, positive impact on safety for child pedestrians and bicyclists. Nearly 80 percent of respondents felt that the project made it safer to cross the street (a key objective of this construction project). About seventy-six percent of respondents felt that the project made walking or bicycling safer, 66.40 percent felt that the project separated drivers and children, and 62.40 percent felt that the project made drivers more aware of children. Less than half of respondents (44.00 percent) felt that the project slowed car traffic.

These responses show that, though the project appears to have had limited impact on increasing walking rates, parents and guardians believe it has made walking and bicycling safer for children.

**Figure 10: Perceived Effects of Project, Valley Elementary School**

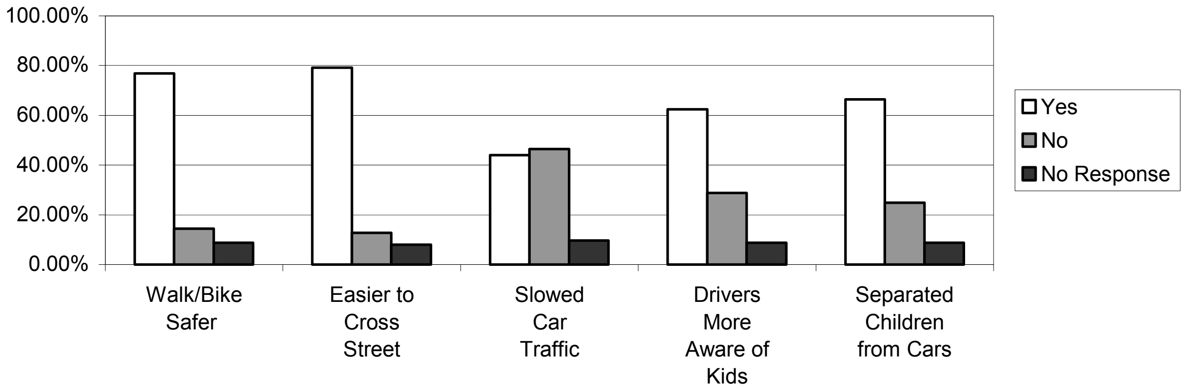



**Table 12: Perceived Effects of Project, Valley Elementary School**

| | Yes | No | No Response |
|---|---|---|---|
| **Walk/Bike Safer** | 96 (76.80%) | 18 (14.40%) | 11 (8.80%) |
| **Easier to Cross Street** | 99 (79.20%) | 16 (12.80%) | 10 (8.00%) |
| **Slowed Car Traffic** | 55 (44.00%) | 58 (46.40%) | 12 (9.60%) |
| **Drivers More Aware of Kids** | 78 (62.40%) | 36 (28.80%) | 11 (8.80%) |
| **Separated Children from Cars** | 83 (66.40%) | 31 (24.80%) | 11 (8.80%) |

### *Parents' perceptions of importance of SR2S construction project*

Over 77 percent of parents perceived this construction project as "important," or as the "most important" construction project that could have been completed to improve safety for children pedestrians and bicyclists near Valley School. Approximately 13 percent of parents felt that this project was "helpful but less important" and no parents characterized the project as "not important." These figures suggest that the project successfully targeted key needs in this neighborhood.

**Figure 11: Perceived Importance of Project, Valley Elementary School**

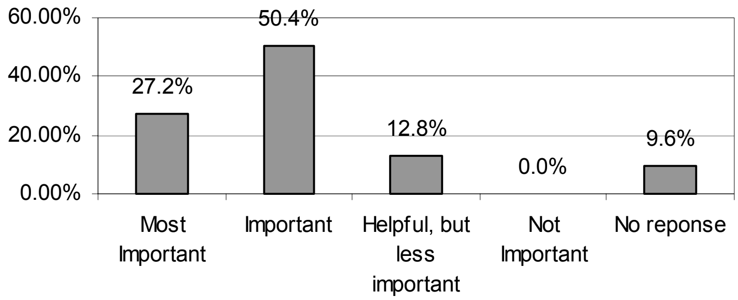



**Table 13: Perceived Importance of Project, Valley Elementary School**

| | |
|---|---|
| **Most important** | 34 (27.20%) |
| **Important** | 63 (50.40%) |
| **Helpful, but less important** | 16 (12.80%) |
| **Not important** | 0 (0.00%) |
| **No response** | 12 (9.60%) |

## West Randall Elementary School

### I. School location and project description

15620 Randall Ave.
Fontana, CA 92335
Contact: Rebecca Wilson, Assistant Principal (primary contact)
Vicki Lamborn, Principal
Phone: (909) 357-5780

Grades: K-5
School population: 1,109
Average class size: 21.7

<u>Ethnic Makeup:</u>
Asian: 0.1%
Hispanic: 92.1%
African American: 1.7%
White: 5.1%
City population (Fontana): 135,100
U.S. Census Classification: "Urban fringe of a large city"

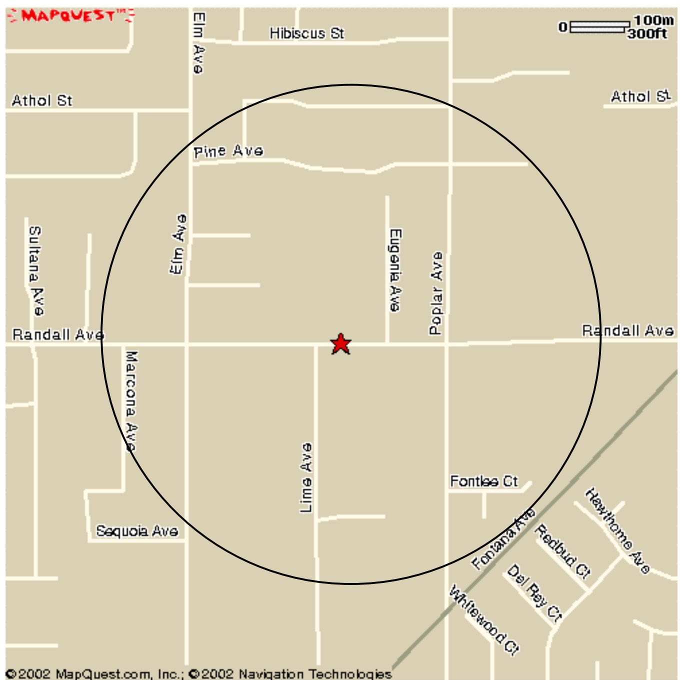
**Dates observed**: 05/22/2002 and 05/24/2002 (before construction); 06/04/2003 and 06/06/2003 (after construction)

**Work Type:** Sidewalk improvements

### *Description of the neighborhood*

This neighborhood is located within an unincorporated area of San Bernardino County. The neighborhood follows a typical suburban pattern. It is an older neighborhood, composed of low-density residential land-uses. There was no commercial development present.

The project took place on Randall Avenue between Marcona and Poplar Avenues. Previously, much of the shoulder of Randall Avenue around the elementary school was dirt and, therefore, prone to dust and mud. The project included the installation of 2,234 feet of sidewalk in addition to curbs and gutters to replace the dirt. The sidewalks now separate pedestrian traffic from automobiles. The proposed project cost is $97,975.




Star indicates location of elementary school; Circle represents portion of neighborhood included in the study (approx. ¼ mile radius from the elementary school)

West Randall Elementary School


Neighborhood proximate to West Randall Elementary School


Randall Avenue after sidewalk improvement


New sidewalk at the Randall Avenue and Lime Avenue intersection

### *Neighborhood characteristics*

Based on before-construction observations of the quarter-mile buffer surrounding West Randall Elementary, this neighborhood has the following urban design characteristics, which are potentially related to pedestrian activity and traffic safety in the area.

**Table 1: Urban Design Characteristics, West Randall Elementary School**

| | |
|---|---|
| **Urban Design Elements Associated with Perceptions of Traffic Safety** | |
| **Blocks with a complete sidewalk** | 36% |
| **Blocks with a complete buffered, sidewalk** | 34% |
| **Blocks with bike lanes** | 0% |
| **Blocks with bike lanes separated from the street** | 0% |
| **Urban Design Elements Associated with Perceived Crime Safety** | |
| **Blocks with first floor windows visible from the street** | 96% |
| **Blocks with street lighting** | 94% |
| **Blocks where abandoned buildings were absent** | 91% |
| **Blocks where rundown buildings were absent** | 91% |
| **Blocks where vacant lots were absent** | 71% |
| **Blocks where graffiti was absent** | 35% |
| **Blocks where undesirable land uses were absent** | 87% |
| **Urban Design Elements Associated with Traffic Volume, Flow and Speed** | |
| **Average number of traffic lanes within a block** | 2 |
| **Average street width of a block (in ft.)** | 39 |
| **Average block length of a block (in ft.)** | 528 |
| **Average sidewalk width of a block (in ft.)** | 5 |
| **Blocks with traffic circles** | 2% |
| **Blocks with bulbouts** | 2% |
| **Blocks with speed bumps** | 2% |
| **Blocks with cul-de-sacs** | 25% |
| **Blocks with medians** | 2% |
| **Blocks with paving treatments** | 2% |
| **Urban Design Elements Associated with Walkability** | |
| **Blocks with street trees** | 22% |
| **Blocks with mixed uses** | 13% |
| **Blocks with public space** | 2% |
| **Blocks with street furniture** | 0% |

## II. Traffic analysis

West Randall Elementary School is located on the northern side of Randall Avenue, a two-lane arterial road. Vehicle and pedestrian data were gathered along Randall Avenue at Lime Avenue on May 22 and May 24, 2002 (pre-construction) and June 4 and June 6, 2003 (post-construction). Morning and afternoon observation periods (45-minutes each) commenced at 8:00 a.m. and 2:58 p.m. respectively, and coincide with the peak flows of school traffic.

### *Vehicle counts*

Figure 1 plots the combined volume of east- and west-bound traffic along San Pablo Dam Road for both the morning and afternoon, pre- and post-construction periods. *Off-peak* values represent the total number of vehicles observed over the last ten minutes of the morning period or the first ten minutes of the afternoon period. These periods typically coincide most closely with traffic patterns outside of school drop off and pick up times. *Peak* values represent the sum of vehicles counted over the ten-minute period with the greatest traffic volume.

In the *before* construction period, the off-peak value for morning vehicle counts was 78 cars in the 10 minute period. This value decreased after the construction of the SR2S project, to 45. Likewise, the peak value for morning vehicle counts was 129 cars before construction, which dropped to 124 after construction of the project. While the peak values for afternoon vehicle counts experienced a similar pattern, dropping from 144 to 138, the afternoon off-peak values actually increased from 81 to 122 after the SR2S project was implemented.

These distributions indicate that a.m. peak traffic volumes were slightly lower than p.m. peak levels, both before and after construction of the SR2S project. Vehicle counts dropped after the construction of the SR2S project for three of the four time periods measured: a.m. off-peak (42 percent), a.m. peak (4 percent) and p.m. peak (4 percent) and increased considerably for the p.m. off-peak period (51 percent) (Table 2).

**Figure 1: Vehicle Counts, West Randall Elementary School**

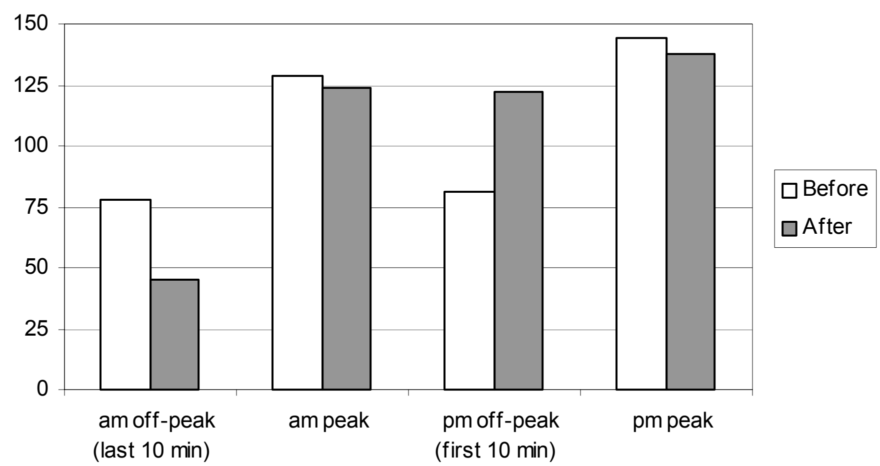



**Table 2: Vehicle Counts, West Randall Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 78 | 45 | -42% |
| **a.m. peak** | 129 | 124 | -4% |
| **p.m. off-peak** | 81 | 122 | 51% |
| **p.m. peak** | 144 | 138 | -4% |

### *Vehicle speeds*

Like vehicle counts, average vehicle speeds are reported with respect to off-peak values, that is, the average speeds observed over the last ten minutes of the morning period and the first ten minutes of the afternoon period. Off-peak vehicle speeds more closely reflect average velocities for non-drop off and pick-up hours. *Peak period* velocities—the lowest ten-minute mean speeds averaged over the two-day observation period—are also provided for the morning and afternoon, pre- and post-construction periods. The error bars in Figure 2 are based on an assumed human accuracy of +/- 0.3 seconds in both the start and stop time used to calculate speed measurements. The researchers believe this is, if anything, an overestimate of the level of human inaccuracy involved in the speed measurements.

Off-peak speeds on Randall Avenue in the morning observation period increased from 23.64 mph in the pre-construction period to 25.93 mph after construction (an increase of 9 percent). Similarly, the peak a.m. average velocities before and after project construction increased from 12.78 mph to 13.98 mph (9 percent). Afternoon off-peak speeds increased from 19.75 mph before construction to 20.48 mph (4 percent) after project construction. The peak p.m. velocities remained relatively constant, increasing 2 percent from 5.09 mph pre-construction to a post-construction average speed of 5.20 mph. Overall, the average velocities around West Randall Elementary School were at or below the posted speed limit (Table 3).

**Figure 2: Average Vehicle Speeds, West Randall Elementary School**

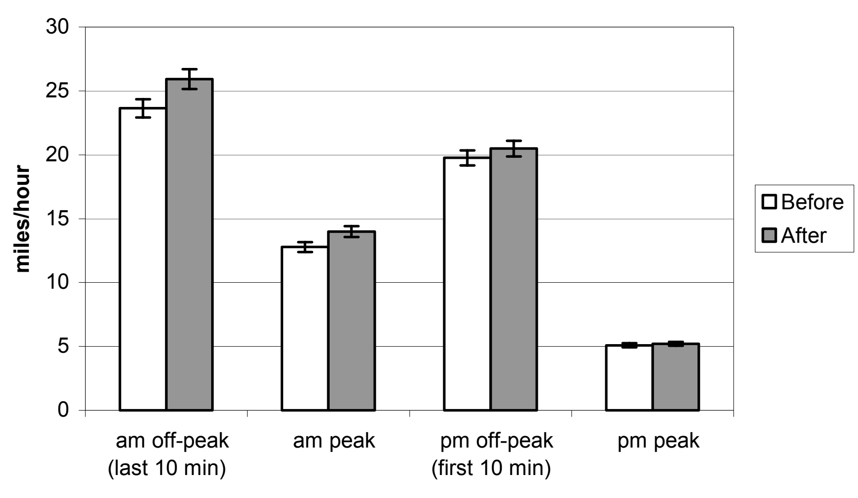



**Table 3: Average Vehicle Speeds, West Randall Elementary School**

| | Before (mph) | After (mph) | % Change |
|---|---|---|---|
| **a.m. off-peak** | 23.64 | 25.93 | 10% |
| **a.m. peak** | 12.78 | 13.98 | 9% |
| **p.m. off-peak** | 19.75 | 20.48 | 4% |
| **p.m. peak** | 5.09 | 5.20 | 2% |

### *Pedestrian and cyclist counts*

*Off-peak* and *peak* count measures are reported for combined pedestrian and cyclist traffic and averaged over a two-day period. Figure 3 plots these values for West Randall Elementary School. The off-peak count remained constant at 1.5 for both the pre- and post-construction a.m. period but increased from 18.5 (pre-construction) to 20.5 (post-construction) in the afternoon period. The post-construction, peak values were greater in both the morning (98.5) and afternoon (161.0) periods compared to the pre-construction values of 68.0 and 120.0 respectively.

Off-peak counts show a considerable amount of pedestrian and cyclist activity, with peak periods occurring in the afternoon. Perhaps most promising is that pedestrian and cyclist activity, with respect to the peak values, surged in both the morning (increase of 45 percent) and afternoon (increase of 34 percent) periods after implementation of the SR2S construction project (Table 4).

**Figure 3: Child Pedestrian Counts, West Randall Elementary School**

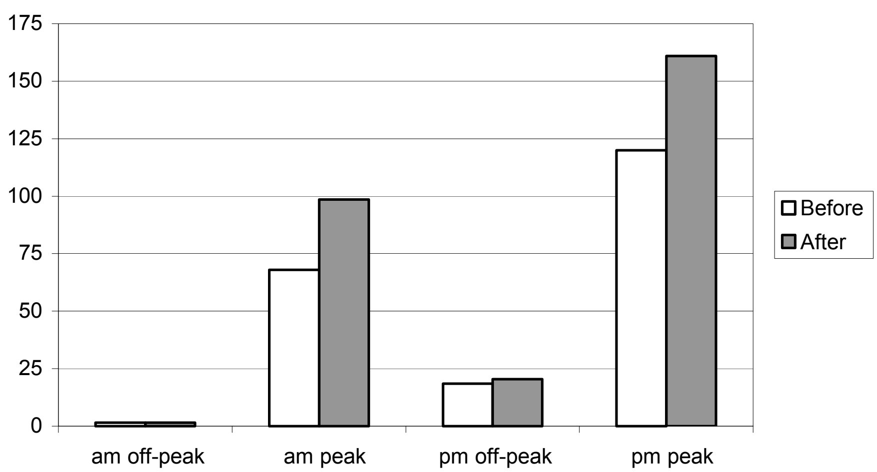



**Table 4: Child Pedestrian Counts, West Randall Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **a.m. off-peak** | 1.5 | 1.5 | 0% |
| **a.m. peak** | 68.0 | 98.5 | 45% |
| **p.m. off-peak** | 18.5 | 20.5 | 11% |
| **p.m. peak** | 120.0 | 161.0 | 34% |

### *Locations of pedestrians*

Researchers monitored the locations of pedestrians relative to the sidewalk or street during 45-minute morning and afternoon observation periods. Figure 4 plots the number of pedestrians who used either: (1) a sidewalk and/or path separated from the street; or (2) a street and/or street shoulder.

Table 5 shows that child pedestrians utilized the street as well as the sidewalk to get to and from school. The number of child pedestrians that used only a sidewalk or path increased dramatically from 172 to 1,083 (a 523 percent increase) after sidewalks were installed. Equally promising is that the number of children observed on a street or street shoulder decreased 88 percent, falling from 520 to 63, after the SR2S project was implemented. In summary, the total number of pedestrians jumped from a pre-construction value of 692 to a post-construction value of 1,146, an increase of 66 percent.

**Figure 4: Child Pedestrian Locations, West Randall Elementary School**


**Table 5: Child Pedestrians Locations, West Randall Elementary School**

| | Before | After | % Change |
|---|---|---|---|
| **Sidewalk or path only** | 172 | 1,083 | 523% |
| **Shoulder or street** | 520 | 63 | -88% |
| ***Total child pedestrians*** | ***692*** | ***1,146*** | ***66%*** |

### *Yielding behavior*

The final facet of the traffic analysis was to document whether automobile drivers adequately yield to pedestrians and cyclists. This behavior was indicated with a basic yes or no: the former specifies that the driver obeyed traffic laws, and waited, if obligated, for the pedestrian or cyclist to proceed safely across the intersection, and the latter suggests that the driver encroached on the pedestrian's path, thereby forcing the person to yield to the motorized vehicle. Figure 5 shows that 99 percent of the observed drivers (154 of 156) yielded during the before project construction observation period, while 100 percent of the 120 refereed motorists fully yielded to pedestrians and cyclists after construction (Table 6).

**Figure 5: Yielding Behavior, West Randall Elementary School**

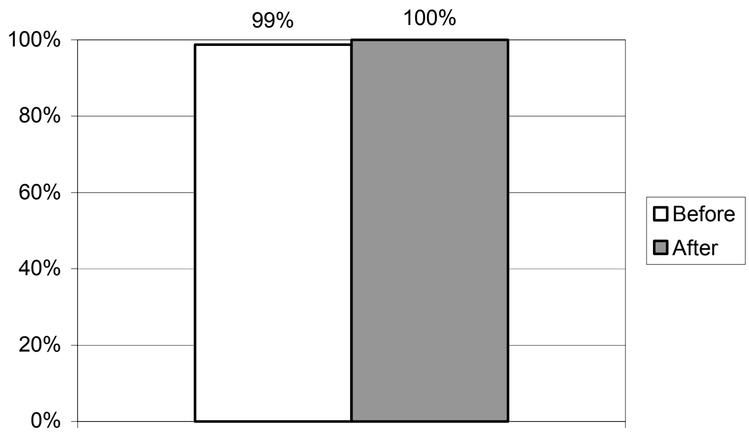



**Table 6: Yielding Behavior, West Randall Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Yielded** | 154 (99%) | 120 (100%) | 154 (99%) |
| **Did not yield** | 2 (1%) | 0 (0%) | 2 (1%) |
| ***Total*** | ***156*** | ***120*** | |

## III. Survey results

The final section of this report focuses on parents' responses to take-home surveys that were distributed before and after project construction. The surveys solicited demographic information such as household size, employment status, and household income, as well as numerous transportation-related responses. Parents were asked to identify the transportation mode their child uses for their journey to and from school, their feelings of the SR2S infrastructure project, and whether or not the construction is likely to change their children's travel behavior. A total of 272 pre-construction (44.52 percent) and 181 post-construction (40.22 percent) surveys were completed by parents of West Randall Elementary School students. A summary of these responses is provided below.

### *Demographic information*

Table 7 summarizes demographic attributes gleaned from the pre- and post-construction survey responses. The investigators wish to emphasize that the before and after values were drawn from two different surveys and two different samples. Therefore, the percentage change of these variables should be interpreted more as a measure of variation between the samples rather than a real change in the population's characteristics.

**Table 7: Demographic Characteristics of Households, West Randall Elementary School**

| | Before | After | Change |
|---|---|---|---|
| ***Average age of child for whom survey was completed*** | 9.69 | 9.71 | 0.02 |
| ***Sex of child (% female)*** | 54.5% | 40.7% | -13.8% |
| ***Average grade of child*** | 4.09 | 4.01 | -0.08 |
| ***Percentage of population living with spouse or significant other*** | 71.3% | 75.1% | 3.8% |
| ***Average number of persons in house*** | 5.93 | 5.63 | -0.30 |
| ***Average number of persons between 6 and 16 years of age*** | 2.47 | 2.48 | 0.01 |
| ***Average number of licensed drivers in household*** | 1.98 | 1.94 | -0.04 |
| ***Average number of cars in household*** | 1.87 | 1.99 | 0.12 |
| ***Average number of persons working full- or part-time*** | 1.32 | 1.38 | 0.06 |
| ***Average number of persons working 20 hours per week or more*** | 1.96 | 1.28 | -0.68 |
| ***Average number of years parent in school*** | 9.99 | 10.43 | 0.44 |
| ***Annual Household Income*** | | | |
| **$15,000 or less** | 60 (22.06%) | 37 (20.44%) | -23 (-1.62%) |
| **$15,001 to $35,000** | 116 (42.65%) | 70 (38.67%) | -46 (-3.97%) |
| **$35,001 to $55,000** | 46 (16.91%) | 30 (16.57%) | -16 (-0.34%) |
| **$55,001 to $75,000** | 9 (3.31%) | 16 (8.84%) | 7 (5.53%) |
| **$75,001 or more** | 8 (2.94%) | 5 (2.76%) | -3 (-0.18%) |
| **No response** | 33 (12.13%) | 23 (12.71%) | -10 (0.57%) |
| ***Years living in neighborhood*** | | | |
| **Under 1 year** | 44 (16.18%) | 25 (13.81%) | -19 (-2.36%) |
| **1 to 5 years** | 125 (45.96%) | 80 (44.20%) | -45 (-1.76%) |
| **6 to 10 years** | 51 (18.75%) | 38 (20.99%) | -13 (2.24%) |
| **Over 10 years** | 34 (12.50%) | 20 (11.05%) | -14 (-1.45%) |
| **Whole life** | 3 (1.10%) | 7 (3.87%) | 4 (2.76%) |
| **No response** | 15 (5.51%) | 11 (6.08%) | -4 (0.56%) |
| ***Years living in U.S.*** | | | |
| **Under 1 year** | 3 (1.10%) | 3 (1.66%) | 0 (0.55%) |
| **1 to 5 years** | 12 (4.41%) | 4 (2.21%) | -8 (-2.20%) |
| **6 to 10 years** | 25 (9.19%) | 13 (7.18%) | -12 (-2.01%) |
| **Over 10 years** | 154 (56.62%) | 70 (38.67%) | -84 (-17.94%) |
| **Whole life** | 65 (23.90%) | 83 (45.86%) | 18 (21.96%) |
| **No response** | 13 (4.78%) | 8 (4.42%) | -5 (-0.36%) |
| ***Born in U.S. (%)*** | 21.43% | 32.16% | 10.73% |

The demographic characteristics suggest that the average age and grade of the child for whom the survey was completed were about 9.71 years and 4.01 respectively. Approximately 75 percent of the parents reported that they lived with a significant other (i.e. husband/wife or boyfriend/girlfriend) and an average 1.38 persons in each household worked full- or part-time. About 81 percent of the respondents have lived in their present neighborhood for over five years and 5.51 percent have lived in the U.S. ten years or less.

Despite a relatively high number of persons per household (5.63), the average household had fewer than 2 cars and 2 licensed drivers. Over 60 percent of the households reported an annual income of $35,000 or less and the parents were in school an average of 10.43 years.

### *Distance from School*

Before project construction, 51.10 percent of parents responded that they lived less than one mile away from their child's school (see Figure 6 and Table 8). About 13 percent lived more than 1 mile away and 36.03 percent did not know or did not answer the question. After project construction, the percentage of parents who responded that they lived less than one mile away increased to 58.56 percent. The percentage of parents responding that they lived more than one mile away decreased fractionally, to 12.71 percent. The percentage of respondents who did not know or who did not respond decreased by about 8 percent, to 28.73 percent.

**Figure 6. Distances From School, West Randall Elementary School**

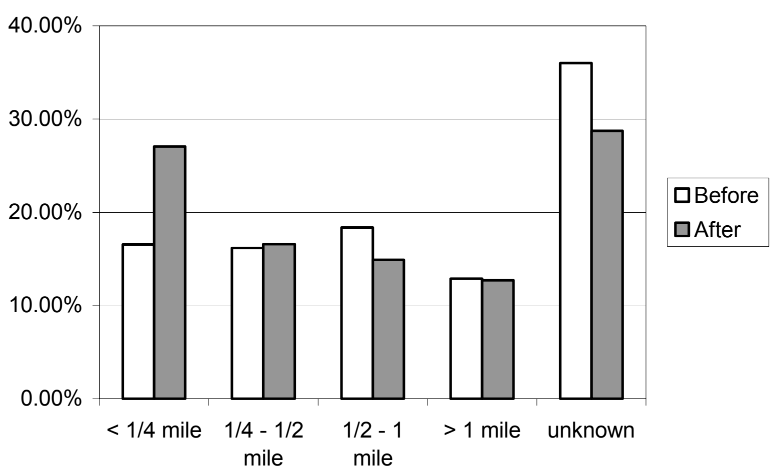



**Table 8. Distances From School, West Randall Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **< 1/4 mile** | 45 (16.54%) | 49 (27.07%) | 4 (10.53%) |
| **1/4 mile–1/2 mile** | 44 (16.18%) | 30 (16.57%) | -14 (0.40%) |
| **1/2 mile–1 mile** | 50 (18.38%) | 27 (14.92%) | -23 (-3.47%) |
| **> 1 mile** | 35 (12.87%) | 23 (12.71%) | -12 (-0.16%) |
| **Missing/Other** | 98 (36.03%) | 52 (28.73%) | -46 (-7.30%) |

### *Transportation mode splits*

Figure 7 charts the share of each transportation mode utilized for the children's commutes to school. From the figure, it can be discerned that the private vehicle is the dominant mode of transport. Approximately 54.78 percent of the children represented in the survey were driven to school in a private automobile in the pre-construction period and 64.64 percent in the post-construction period. Bus and transit represent a fairly small share of pre- and post-construction commutes (7.72 percent and 5.52 percent, respectively) and the combined share of those who walked or bicycled amounted to 31.99 percent in the pre-construction period. Surprisingly, the combined number of those who bicycled or walked actually fell from 87 to 39 (a 10.44 percent decrease) after the sidewalks were installed (Table 9).

**Figure 7: Transportation Mode Splits for Commutes to School, West Randall Elementary School**

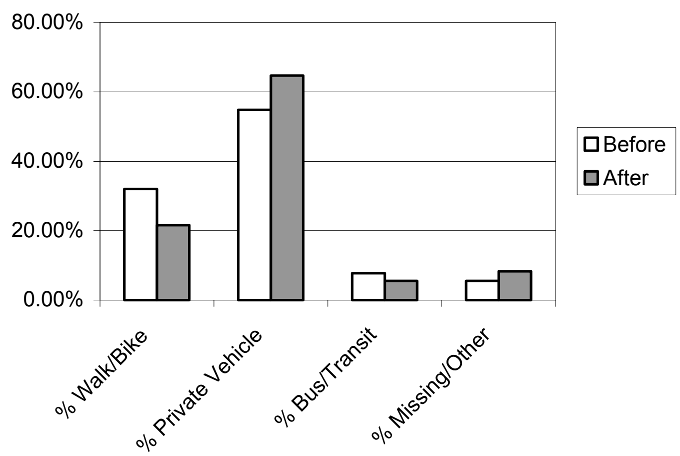



**Table 9: Transportation Mode Splits for Commutes to School, West Randall Elementary School**

| | Before | After | Change |
|---|---|---|---|
| **Walk/bike** | 87 (31.99%) | 39 (21.55%) | -48 (-10.44%) |
| **Private vehicle** | 149 (54.78%) | 117 (64.64%) | -32 (9.86%) |
| **Bus/transit** | 21 (7.72%) | 10 (5.52%) | -11 (-2.20%) |
| **Missing/other** | 15 (5.51%) | 15 (8.29%) | 0 (2.77%) |

### *Transportation mode splits by distance from school*

A cross-tabulation of transportation mode by distance from school suggests that location is associated with the likelihood that a child walks or bicycles to school (Figure 8). For example, 20 of the 27 children who walked to West Randall Elementary after the project was constructed lived within a quarter-mile of the school's campus and the remaining 7 lived within a mile of school. The share of students that commuted by private vehicle was also lower for families living within a quarter-mile of school (50.00 percent) than children living over a mile from school (82.61 percent). The private vehicle share was 90.00 percent for children living between a quarter-mile and a half-mile from school and 74.07 percent for those living between a half-mile and 1 mile from school (Table 10).

**Figure 8: Transportation Mode Splits for Commutes to School by Distance from School , West Randall Elementary School**

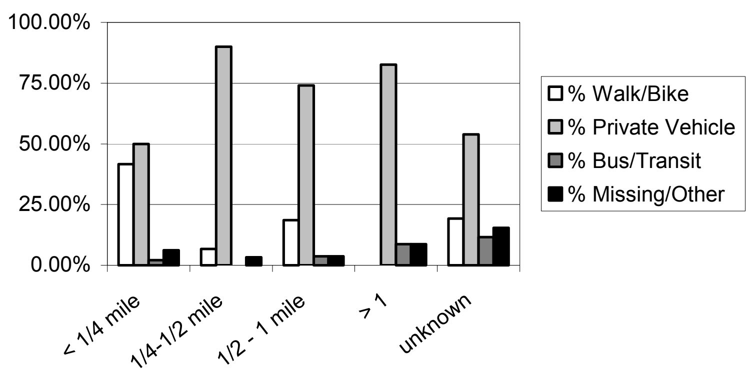



**Table 10: Transportation Mode Splits for Commutes to School by Distance from School , West Randall Elementary School**

| | < 1/4 mile | 1/4-1/2 mile | 1/2 - 1 mile | > 1 mile | unknown |
|---|---|---|---|---|---|
| **Walk/bike** | 20 (41.67%) | 2 (6.67%) | 5 (18.52%) | 0 (0.00%) | 10 (19.23%) |
| **Private vehicle** | 24 (50.00%) | 27 (90.00%) | 20 (74.07%) | 19 (82.61%) | 28 (53.85%) |
| **Bus/transit** | 1 (2.08%) | 0 (0.00%) | 1 (3.70%) | 2 (8.70%) | 6 (11.54%) |
| **Missing/other** | 3 (6.25%) | 1 (3.33%) | 1 (3.70%) | 2 (8.70%) | 8 (15.38%) |

### *Location of SR2S construction project relative to survey respondents*

Survey results reveal a net gain of only one child who bicycles or walks to school more often after implementation of the SR2S project. It appears from Figure 9 that the location of the SR2S construction project may influence the frequency that children walk to school. For example, survey results indicate that 18 of the 63 children (21.48 percent) whose usual route to school coincides with the SR2S project walked to school more often than before the sidewalk was constructed, while only 9 of these children (10.71 percent) walked less. In contrast, only 4 of the 54 children (4.49 percent) whose usual route did not coincide with the sidewalk construction walked more, while 12 (13.48 percent) walked less (Table 11).

**Figure 9: Project Along Usual Route vs. Percentage Walked, West Randall Elementary School**

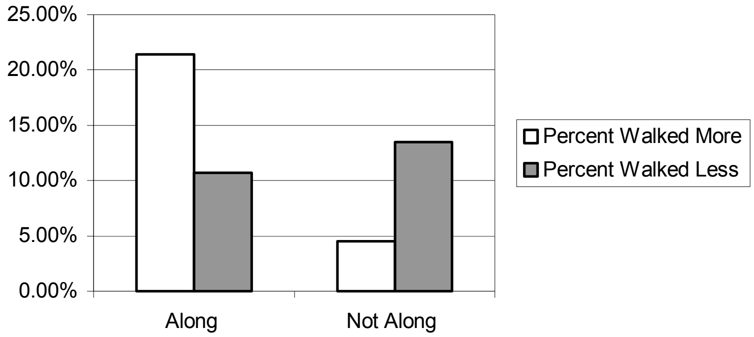



**Table 11: Project Along Usual Route vs. Percentage Walked, West Randall Elementary School**

| | Along Route | Not Along Route |
|---|---|---|
| **Percent walked more** | 18 (21.43%) | 4 (4.49%) |
| **Percent walked less** | 9 (10.71%) | 12 (13.48%) |

### *Parents' perceptions of effects of SR2S construction project*

The West Randall after-construction survey also collected information concerning the parents' perceptions of the project's effects. A majority of parents feel that the project produced favorable results such as slowing traffic (54.70 percent), easing street crossings (66.85 percent), separating children from cars (64.64 percent), and making motorists more aware of children along the road (65.19 percent). In general, 68.51 percent of the surveyed parents feel the project enhances safety for child pedestrians and bicyclists (Figure 10 and Table 12).

**Figure 10: Perceived Effects of Project, West Randall Elementary School**

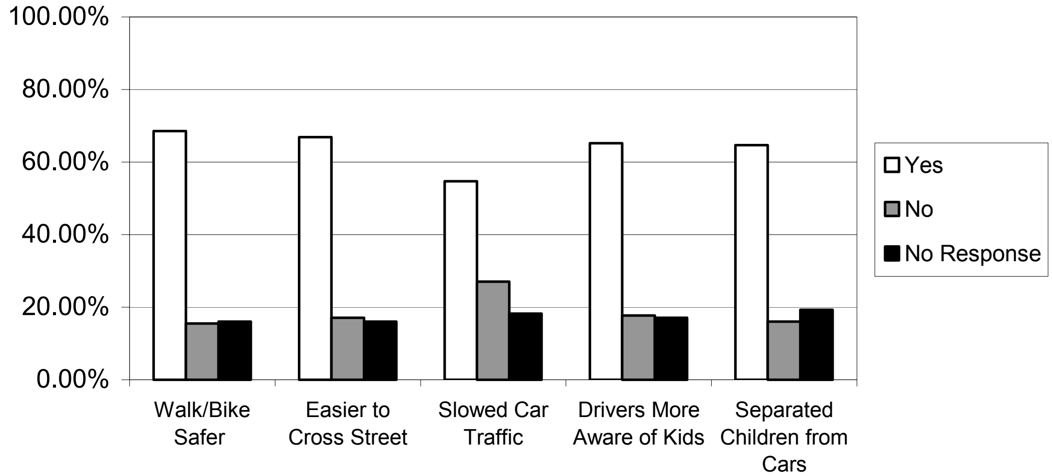



**Table 12: Perceived Effects of Project, West Randall Elementary School**

| | Yes | No | No Response |
|---|---|---|---|
| **Walk/bike safer** | 124 (68.51%) | 28 (15.47%) | 29 (16.02%) |
| **Easier to cross street** | 121 (66.85%) | 31 (17.13%) | 29 (16.02%) |
| **Slows car traffic** | 99 (54.70%) | 49 (27.07%) | 33 (18.23%) |
| **Drivers more aware of children** | 118 (65.19%) | 32 (17.68%) | 31 (17.13%) |
| **Separates children from cars** | 117 (64.64%) | 29 (16.02%) | 35 (19.34%) |

### *Parents' perceptions of importance of SR2S construction project*

The final part of this section briefly outlines the parents' perceptions of the importance of the SR2S project. Figure 10 shows that 32.04 percent of the respondents feel the project is the single most important construction project that could have been built while 39.23 percent believe that it was among the few most important construction projects that could have been built. Only 3 of the 144 parents that responded to this question (1.66 percent) felt that the project was not at all important (Figure 11 and Table 13).

**Figure 11: Perceived Importance of Project, West Randall Elementary School**

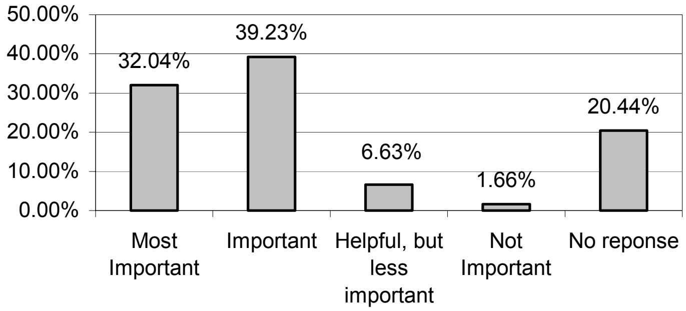



**Table 13: Perceived Importance of Project, West Randall Elementary School**

| | |
|---|---|
| **Most Important** | 58 (32.04%) |
| **Important** | 71 (39.23%) |
| **Helpful, but less important** | 12 (6.63%) |
| **Not Important** | 3 (1.66%) |
| **No response** | 37 (20.44%) |

## OVERVIEW AND CONCLUSIONS

This study gathered two types of data that can be used to evaluate the SR2S projects that were studied—objective data on traffic, pedestrian, and bicycle activity, and subjective data that reflect the opinions of parents and self-reported (by parents) behavior of children at the schools. Both data are reviewed here in assessing whether each of the nine projects was a success.

### Expected Results

Each SR2S project had different expected outcomes, and the success of each project is gauged by whether the measured results matched expected results. Sidewalk improvement projects are generally not expected to slow vehicle traffic or reduce vehicle counts, while a bicycle path may not influence the amount of walking or the yielding of vehicles to pedestrians. While these generalizations might not hold for all SR2S projects, the different SR2S projects certainly had different expected outcomes. The following is a summary of the expected outcomes for each project studied in this report. In the table below, "+" denotes an expected increase after SR2S project construction, "–" denotes an expected decrease, and impacts denoted by (?) are less strongly expected than the other impacts.

## Project Description and Expected Impact

| Project Information | | | Expected Impacts | | | | |
|---|---|---|---|---|---|---|---|
| | | | Walking/Bicycling Impacts | | Traffic Impacts | | |
| **Project Type** | **School** | **Project Description** | **Amount** | **Location** | **Vehicle Counts** | **Vehicle Speed** | **Yielding** |
| Traffic Control Devices | Cesar Chavez Elementary | Traffic light replaces 4-way stop sign | + (?) | None | - (?) | - | + |
| Pedestrian/Bicycle Crossing | Glenoaks Elementary | In pavement crosswalk lighting | + (?) | None | None | - [a] | + |
| Pedestrian/Bicycle Crossing | Jasper Elementary | In pavement flashing warning light [b] | + | None | None | - | + |
| Sidewalk Improvements | Juan Cabrillo Elementary | Pathway of decomposed granite with wood curb | + | On sidewalk | None | None | None |
| Pedestrian/Bicycle Crossing | Mt. Vernon Elementary | Pedestrian "countdown" crossing light [c] | + (?) | None | None | None | None |
| Sidewalk Improvement and Bicycle Facilities | Murrieta Elementary | Sidewalk and bicycle path construction | + | On sidewalk | None | None | None |
| Sidewalk Improvements | Sheldon Elementary | Sidewalk gap closures (about 400 feet) | + | On sidewalk | None | None | None |
| Sidewalk Improvements and Pedestrian/Bike Crossing | Valley Elementary | Sidewalk gap closures (3,000 ft.) and crosswalk | + | On sidewalk | None | - (?) | + |
| Sidewalk Improvements | West Randall Elementary | Sidewalk gap closures (about 2,200 feet) | + | On sidewalk | None | None | None |

Notes: "Location" refers to walking only, and whether walking occurs on sidewalk/path or street/shoulder. For location, "on -sidewalk" indicates an expected increase in walking on a sidewalk or path. Yielding refers to yielding of vehicles to pedestrians/bicyclists only. Expected impacts denoted by "?" are less strongly expected.

[a] At Glenoaks, note that traffic at the location of the crosswalk lighting system in front of the school, was congested before the improvement, which reduces the likelihood of further reductions in vehicle speeds.

[b] No traffic signal or 4-way stop was located at this intersection, before or after SR2S project construction. The warning light is in-pavement lighting.

[c] An existing traffic light was located at this intersection. Pedestrian "countdown" light shows time remaining before light changes.

The following project types are represented in the before/after analysis: Sidewalk Improvements, Pedestrian/Bicycle Crossings, Traffic Control Devices, and Bicycle Facilities. Two types of projects are not represented in the before/after analysis: Traffic Calming and Traffic Diversion. The study sites for those two project types (La Gloria Elementary, Hawthorne Elementary, and Sulphur Springs Elementary) had not finished SR2S project construction by the time data were analyzed for this report.

**Measured Results**

The results of the evaluation for each of the nine schools studied are summarized below. For each school, the summary highlights the outcomes that are expected to be key indicators of success. As examples, the traffic light at Cesar Chavez Elementary is expected to increase yielding of vehicles to pedestrians and the sidewalk gap closures or walking paths at Juan Cabrillo, Murrieta, Sheldon, Valley, and West Randall are expected to shift pedestrian traffic from a street or shoulder onto a sidewalk or path. The summary assessment below includes information about the most important outcome indicators, with an overall assessment of whether or not the project was a success. More complete data for each school are provided in Volume 2 of this report.

| School | SR2S Work Type | Project Description | Evidence of Success | Summary of Measured Results and Comments |
|---|---|---|---|---|
| Cesar Chavez Elementary | Traffic Control Device | Traffic signal at intersection that previously had no signal | Strong evidence of success | Increase in yielding of vehicles to pedestrians; decrease in vehicle speed; in area with high amounts of walking (walk/bike mode split at school approximately 50%) |
| Glenoaks Elementary | Pedestrian/ Bicycle Crossing | In-pavement crosswalk lighting | Strong evidence of success | Increase in yielding of vehicles to pedestrians; pedestrian counts show increase in walking |
| Jasper Elementary | Pedestrian/ Bicycle Crossing | In-pavement crosswalk lighting | No evidence of success | No change in yielding of vehicles to pedestrians; simultaneous opening of I-210 Freeway extension confounds measurement for this project, as I-210 appears to have diverted traffic from SR2S site, which could be associated with the observed increase in vehicle speeds at SR2S site |
| Juan Cabrillo Elementary | Sidewalk Improvement | Walking path | Weak evidence of success | Shift in walking from street/shoulder to path, but little walking was on street or shoulder before SR2S construction; low walking rates (walk/bike mode split from 5% to 7%) and most pedestrians are children and parents who drove to school, park down the street, and then walk into school |
| Mt. Vernon Elementary | Pedestrian/ Bicycle Crossing | Pedestrian warning light at intersection that already had traffic signal | No evidence of success | No change in amount of walking; project’s main effect might have been convenience, which is not well measured by the objective outcome indicators summarized here |
| Murrieta Elementary | Sidewalk Improvement and Bicycle Facilities | New sidewalks and on-street bicycle paths | No evidence of success | Very low walking/bicycling amounts before and after SR2S project construction |

| School | SR2S Work Type | Project Description | Evidence of Success | Summary of Measured Results and Comments |
|---|---|---|---|---|
| Sheldon Elementary | Sidewalk Improvement | Sidewalk gap closures | Strong evidence of success | Shift in walking from street/shoulder to path (34% of observed child pedestrians on sidewalk before SR2S project, compared with 65% on sidewalk after SR2S project); fast vehicle speeds on adjacent road (average from 30 to 40 mph) suggests large increase in safety from separation of pedestrians and vehicles; some evidence of increase in amount of walking |
| Valley Elementary | Sidewalk Improvement and Pedestrian/ Bicycle Crossing | Sidewalk gap closures and new crosswalk | Strong evidence of success | Shift in walking from street/shoulder to path (58% of observed child pedestrians on sidewalk before SR2S project, compared with 96% on sidewalk after SR2S project) |
| West Randall Elementary | Sidewalk Improvement | Sidewalk gap closures | Strong evidence of success | Shift in walking from street/shoulder to path (25% of observed child pedestrians on sidewalk before SR2S project, compared with 95% on sidewalk after SR2S project); high levels of walking before and after project; walking increased after SR2S project |

Overall, the research team found strong evidence of success at five of the nine schools studied (Cesar Chavez Elementary, Glenoaks Elementary, Sheldon Elementary, Valley Elementary, and West Randall Elementary). Schools were classified as having strong evidence of success if the measured outcomes corresponded to expected outcomes, if the measured outcomes exceeded the sample error in the survey data or the estimated human error in data collection (as appropriate), if the data provide a consistent indicator of project success, and if the magnitude of impact was reasonably large. In the case of Murrieta Elementary, for example, even though the research indicated a large percentage increase in pedestrian counts, the "before construction" base was so small (2 pedestrians observed over two days of observation) that the observed increase (to 19 pedestrians over two days) was not judged sufficiently large to provide evidence of SR2S project success.

Note that these are strict, possibly overly strict, criteria for project success. These criteria require that a project produce a near-term, measurable impact that can be observed. Projects that contribute to behaviors that cannot be easily measured but that contribute to safety would not be ranked as a success by these criteria. For example, crosswalk lighting systems that increase driver awareness of pedestrians might not increase yield rates if yielding was already high and also might not measurably slow vehicle speeds if most vehicles slowed for pedestrians before the warning light. Given that collisions with pedestrians are rare events, an increase in safety from such a crosswalk lighting system could be real, but the measured outcomes of this study would not indicate that the project was a success. Similarly, projects that improve the walking environment in an incremental fashion, such as sidewalk gap closures in areas that were initially not conducive to walking, also would not rank as a success by these criteria, even if such projects were sensible parts of a long-term strategy to improve pedestrian or bicyclist activity and safety. Lastly, other events or programs could confound some SR2S project impacts. At Jasper Elementary, for example, the nearby opening of the I-210 Freeway extension diverted traffic from 19$^{th}$ Street, which could have masked any effect that pedestrian/bicycle crossing project might have had on slower vehicle speeds. Overall, the ranking of "strong evidence of success" likely understates the success of the SR2S program.

The rankings of success provide good comparative information. Some SR2S programs clearly delivered more immediate and measurable success than did others. A lack of immediate success does not necessarily indicate a failure of the project, however. The sidewalks and bicycle paths near Murrieta Elementary, for example, could be justified as necessary infrastructure that, with later improvements, might contribute to increases in walking and bicycling. In the quarter-mile circle around Murrieta Elementary, only 8 percent of the blocks had a complete sidewalk before the SR2S project—one of the lowest percentages of sidewalks at any school studied. Thus the sidewalks at Murrieta Elementary might be justified not based on any prospect for immediate impact, but because the neighborhood had very poor walking infrastructure before the SR2S program. Similar statements might be made about other programs.

Against that backdrop, the fact that five of nine projects received a ranking of "strong evidence of success" suggests that the SR2S program on the whole was highly successful, as the value of the SR2S program is almost certainly underestimated by a simple count of programs that received a ranking of "strong evidence of success." In other words, the criterion for overall program success should not be that all SR2S projects deliver immediate and unambiguously measurable impacts, as that would not be possible even in the best of circumstances.

### Evidence of Project Success by Work Type

The nine schools studies included four SR2S work types. Included are five sidewalk improvement projects, four pedestrian/bicycle crossing projects, one traffic control device project, and one bicycle facility project among the nine schools studied. Some patterns emerge from examining the evidence of project success across different work types.

Among the five sidewalk improvement projects studied, the SR2S sidewalk improvements at three schools (Sheldon, Valley, and West Randall) showed strong evidence of success. In all three cases, the success of the project was based primarily on large improvements in separating pedestrian traffic from vehicle traffic. At Sheldon Elementary, the fraction of children observed walking exclusively on the sidewalk increased from 34% before SR2S construction to 65% after SR2S construction. At Valley Elementary, the fraction of children observed walking exclusively on the sidewalk increased from 58% to 96%. At West Randall Elementary, the fraction of children observed walking exclusively on the sidewalk increased from 25% to 95%. These changes connote substantial safety improvements. Based on the experience at these schools, sidewalk gap closures at locations with moderate or heavy pre-existing pedestrian traffic are good candidates for SR2S funding.

Of the four schools with pedestrian/bicycle crossing improvements, the SR2S project at two schools (Glenoaks Elementary and Valley Elementary) showed strong evidence of success. The success of the project at Valley Elementary is based more on the sidewalk improvements than on the crosswalk. One of the more impressive outcome measures at Valley Elementary was the shift of pedestrians from the street or shoulder onto the sidewalk, which is likely due to the sidewalk gap closures. Thus, the only school where there is strong evidence of success for a pedestrian/bicycle crossing improvement is Glenoaks Elementary. While the measured success of the pedestrian/ bicycle crossing improvements seems less impressive than for the sidewalk improvement projects, note that the impact of pedestrian/ bicycle crossing improvements might be more difficult to measure. To the extent that those projects increase driver or pedestrian awareness, safety could increase in ways that would not be measured by the methods used in this study.

The traffic control device, a traffic signal at Cesar Chavez Elementary, showed strong evidence of success. It appears that traffic signals that regulate vehicle yielding can produce important improvements in safety, especially near schools with a large amount of walking and bicycle travel.

The only bicycle facility, on-street bicycle paths near Murrieta Elementary, showed no evidence of success. There was little observed bicycling before or after SR2S project construction. Had there been more bicycle traffic before SR2S construction, the project might have had important value by separating that traffic from vehicles. As is, the bicycle path by itself appeared to do little to increase the amount of bicycle travel, suggesting that bicycle facilities might be restricted to either schools with moderate or high pre-existing levels of bicycle travel or to schools where a bicycle path brings a reasonable *a priori* expectation of increases in bicycle travel.

Overall, the most successful work types, based on the data summarized above, appear to be sidewalk gap closures in areas with pre-existing pedestrian traffic, or traffic signals in areas with large amount of both pedestrian or vehicle traffic.

## Parental Opinion

The parent surveys revealed that parents at all schools had highly positive opinions about the SR2S projects.  The survey responses to key indicators of parental opinion are summarized below.

| ***School*** | **Noticed project** | **Believed project made walk/bike safer** | **Believed project was most important or important** | **Believed project was most important** |
|---|---|---|---|---|
| Caesar Chavez Elementary | 82% | 85% | 76% | 40% |
| Glenoaks Elementary | 70% | 77% | 70% | 51% |
| Jasper Elementary | 86% | 64% | 68% | 44% |
| Juan Cabrillo Elementary | 82% | 87% | 63% | 50% |
| Mt. Vernon Elementary | 65% | 71% | 59% | 37% |
| Murrieta Elementary | 86% | 85% | 75% | 60% |
| Sheldon Elementary | 75% | 84% | 78% | 44% |
| Valley Elementary | 77% | 77% | 78% | 50% |
| West Randall Elementary | 69% | 69% | 71% | 39% |

The table above shows the percentage of survey respondents (parents of 3rd through 5th grade children at the study schools) who noticed the SR2S project, believed the project increased safety, and the percentage who ranked the SR2S project near their school as either the most important project possible or an important project.  The last column shows the percentage of parents who ranked the SR2S project near their school as the most important project that could have been built.

Note that the SR2S projects fare very well when measured by parental opinion.  Large majorities of parents at all schools noticed the project, stated that the project would increase safety, and had a favorable opinion of the project.  In some instances, a larger fraction of parents stated that they believed they project would increase safety than stated that they noticed the project.  In those cases, a few parents are likely offering a favorable opinion about the SR2S project based on the brief description in the "after construction" survey.  Yet the description of the SR2S project in the survey was minimal, and was written in neutral terms that would not signal any judgment about the effectiveness or wisdom of the project.  Hence, the strong positive opinion ratings shown above provide solid evidence of parental approval of the SR2S program.  At all schools studied, a large majority of parents had a favorable opinion of the SR2S project near their schools.

## Conclusions and Recommendations

Using data that are limited to measurable changes in vehicle or pedestrian/ bicyclist traffic, five of the nine schools showed strong evidence of success. This finding likely underestimates the beneficial impact of the SR2S program, as changes that are long-term in nature or that might increase driver or pedestrian/bicycle awareness could go undetected in the outcome data used in this study.

The SR2S projects were also broadly popular with parents at all nine study schools. In four of the nine schools, more than 50% of parents surveyed stated that the SR2S project was "the single most important construction project that could have been built" near their child's school. The lowest ranking for that question was at West Randall, where 39% of parents stated that the SR2S project was the single most important project that could have been built, and another 32% ranked the project as "important."

Overall, given the strong parental approval of the SR2S projects and the encouraging changes in traffic, pedestrian, and bicycle traffic, the research team concludes that the SR2S construction program has been successful in meeting its goals. It is the recommendation of the research team that the program be continued. Future SR2S funding cycles can build on the lessons learned in this evaluation. Specific recommendations include the following:

- Sidewalk gap closures near schools with moderate or high amounts of walking appear to be strong candidates for SR2S funding. Such projects are especially likely to produce increases in pedestrian safety.
- Traffic control projects that regulate yielding at intersections where large volumes of vehicle and pedestrian traffic intersect also are good candidates for SR2S funding.
- At schools where there are low levels of walking or bicycle travel, SR2S construction by itself will likely not be sufficient to increase non-motorized travel to or from school. At such locations, SR2S construction funding should be coupled with more intensive education campaigns or additional construction improvements at the schools to encourage students to walk or bicycle to school.
- In general, schools should be encouraged to leverage SR2S funds by providing education that encourages students to walk and bicycle safely to and from school. Including participation in National Walk to School Day as a criterion for evaluating applications for SR2S funding is one way to couple education more tightly with the construction program.

Future research should also continue to track the outcome of SR2S construction programs. Such future research can examine more long-term outcomes of SR2S construction. One example would be studies that would track accident rates, taking advantage of longer time series than would have been available in the research reported here.